THE ILLUMINATING ENGINEER
THE JOURNAL OF
GOOD LIGHTING
LIGHT LAMPS FITTINGS AND ILLUMINATION
OIL GAS ELECTRICITY ACETYLENE PETROL-AIR GAS ETC.
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The Application of Electric Lamps to Advertising

THE paper read on the above subject by Mr. H. Lingard at the last meeting of the Illuminating Engineering Society (see pp. 6-13) covered new ground. The use of light for advertising has been discussed at previous meetings of the Society in general terms, but it is, we think, the first time that an attempt has been made to place before the Society definite relations determining the height of letter, number and size of lamps, etc., for the guidance of designers of signs to be viewed at a considerable distance. The data on "irradiation" are also of considerable interest, and the preparation of all these experimental data must have involved a great deal of patient work.

The latter part of the paper was devoted to a survey of various forms of signs for short-distance viewing, silhouette signs, shop-fascia lighting, etc., and was supplemented by a most interesting demonstration of modern types of signs, some of them highly ingenious and effective. As one of the speakers in the discussion remarked, it is somewhat singular, in view of the wealth of good material available, that imperfectly designed luminous signs are still so frequently seen. This is a matter which might well be commended to the notice of such bodies as the Master Sign Makers' Association. Our attention has been drawn to two specifications issued by this body, relating respectively to signs made of wood and of metal. These specifications relate to such matters as construction, electric wiring, minimum thickness of letters and minimum number of holders, etc., and are most useful so far as they go. Possibly the Association might consider drafting further recommendations bearing on the various points discussed in Mr. Lingard's paper, which have such an important bearing on visibility.

Reference was made in the paper to the long-standing conflict between the claims of publicity and æsthetic considerations. We think it might be said with justice that the design of luminous signs in this country has been characterized by restraint. The tendency has been to aim at the production of ingeniously contrived original effects, rather than to stamp home an impression by mere size and brilliancy. It is natural that some degree of restriction on luminous signs should be exercised—alike in the interests of the public and the advertisers themselves. But it is unfortunate that existing regulations should be so varied, and in many cases also obsolete in wording and obscure in intention. Strange to say, local regulations have often no bearing on such really important points as brilliancy and are concerned merely with dimensions and mechanical details.

In many cases, too, the use of luminous signs is absolutely prohibited by the conditions imposed in the lease of a building. This prohibition is usually intended to prevent the use of the exterior of the building for advertising purposes; but it does in fact also prevent the use of a descriptive sign showing the nature of the building, which might be of considerable service to the public.

Experience on the leading railway systems, and more especially the Underground Railways of London, has shown the immense value of luminous signs for conveying information. We look forward to the time when every dwelling-house will be equipped with an easily recognizable luminous number, and all important public buildings to which the public has frequent access furnished with a tastefully executed but clear luminous notice, so that its character may be quickly recognized.

Readers of this journal will recall that in several instances, for example in Helsingfors (in Finland) and in some German cities, the use of an illuminated number by householders is obligatory. Local authorities in this country who have recently exercised powers to secure adequate numbering of houses might also make some effort to ensure these numbers being visible by night; this is a reform, long overdue, which would save the public much inconvenience.

TWENTY-FIRST ANNIVERSARY OF "THE ILLUMINATING ENGINEER"

With this issue *The Illuminating Engineer* comes of age. The first number appeared in January, 1908, and the conclusion of 20 years of existence was celebrated by the publication of our Special Twentieth Anniversary Number in January last year. We do not feel it necessary to prepare again a special anniversary number, but the attainment of our Twenty-first Anniversary should not go entirely unnoticed. We therefore take this opportunity of thanking contributors, readers and advertisers for their co-operation during the past 21 years, and we hope, with their help, to make the journal even more useful in the future than in the past.

Illumination on the Railways

THE discussion on illuminated signs at the last meeting of the Illuminating Engineering Society, referred to on the previous page, leads one to emphasize the important opportunities for their use on the leading railway systems. On the most progressive railways we now see continual evidence of their value for the purpose of furnishing information to travellers. It is, however, an anomaly that even to-day there are many railway termini where no effort is made to indicate their existence to passengers by suitable illuminated signs, visible at a distance. In other respects we do see signs of progress in lighting, though not as generally as one could desire. Waterloo is justly regarded as one of the best-lighted London termini. The lighting of Victoria Station has also been much improved. The *concours* of the old London, Chatham and Dover section, formerly distinctly gloomy, is now quite brightly illuminated by high-power gasfilled lamps in opal bulbs. The illumination of the main destination board enables data to be read with ease. One is also glad to notice the introduction of the racks of time-tables, illuminated from within, which have proved so useful at Waterloo. In these respects conditions now present a contrast to those at Charing Cross, where information of arrivals and departures of trains is still furnished by obsolete and inadequate methods.

Another new feature at Victoria Station is the local branch of the National and Provincial Bank, a compact building with a light exterior illuminated by concealed units. Such innovations do much to brighten the railway station and relieve the gloom arising from the dingy surfaces and high roof. It is, we believe, common knowledge that the letting of space for advertising and trading purposes has proved one of the most profitable sources of revenue to railway companies during recent years. We may expect, therefore, to see the installation of shops and kiosks in and around railway termini still further developed, and, as they pay for their own lighting, no objection to generosity in this respect is likely to be raised by the railway companies.

We have another instance of this tendency in the courtyard of Victoria Station, where a number of supplementary shops have recently come into being. Such enterprise helps to brighten the approach to a railway station, but we hope that the natural desire of railway companies to make good commercial use of available sites will not tempt them into permitting indiscriminate additions such as would be out of harmony with the general design.

An interesting event during the past month has been the opening of the new Piccadilly Circus Underground Junction station, the unusual design of which has been the subject of much comment in the press. Here again we see the same principle applied. The vast circular space under the Circus carries a series of shop windows round its circumference, and the illumination of the area—effected mainly by a novel arrangement of cylindrical diffusing units attached to the columns—is exceptionally high for a railway station. The series of escalators is lighted by means of indirect pedestal units, similar to those recently adopted for the new escalator at Waterloo, and the method is carried further by the installation of similar but more lengthy indirect standards at the base of the escalators.

We understand that there is a prospect that this novel installation will be described before the Illuminating Engineering Society shortly, and therefore we shall not enter into fuller descriptive details at present. The new station is certainly unique, and has been planned on highly enterprising lines.

"Modernistic" Lighting

WE present elsewhere in this issue a summary of the paper on "Modern Lighting Designs for Interiors," recently read by Mr. H. T. Young at the E.D.A. Conference on November 15th (see p. 16). We commented upon this subject in our last issue.* One does not feel that we have yet a really satisfying term to describe these new lighting designs—"modernistic" and "architectural" lighting have been suggested, but neither quite meets requirements. Briefly one might say that the new system, which appears to have emanated from France, is based on the elimination of conventional types of fittings, translucent glass taking the place of much of the metal commonly used.

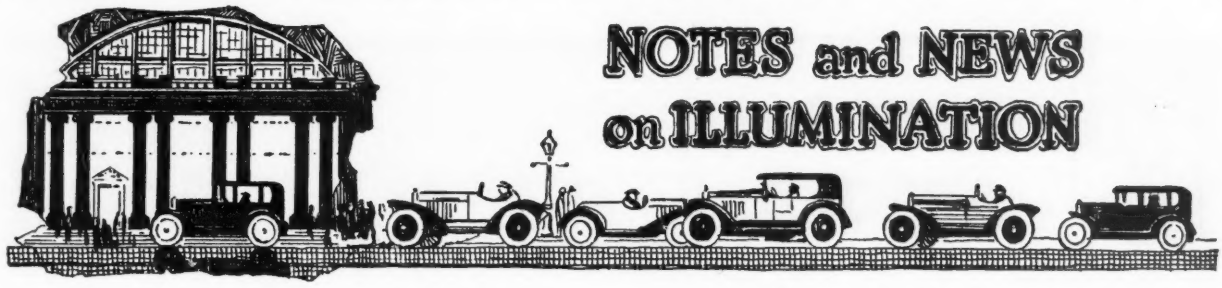
In a recent issue of *Lux* we notice two articles, by M. Perzel and M. Maisonneuve, illustrating this mode of lighting. The former describes a number of singular patterns in glass resembling those now being introduced in England, and the latter presents several views of original installations—one of them a room lighted solely by rectangular patterns of diffusing glass, mounted flush with the ceiling and distributed according to a geometrical design.

One observes at once, however, that there are really two distinct modes of applying this modernistic lighting. We have firstly the attempt to replace chandeliers, bowls, or table standards by new geometrical designs executed in fancy translucent glass which assume various bizarre or geometrical forms. Let it be observed that we have here still a "fitting," only it differs entirely in appearance from lighting fittings in the accepted sense of the term. Mr. Young contended that hitherto illuminating engineers have been too subservient to the claims of efficiency. Yet one feels that existing forms of fittings have really been developed to meet certain needs. The ordinary table lamp, with its shade designed to screen the lamp and spread the light over the table, is probably better adapted for this purpose than most of the "modernistic" glassware designs which we have seen. Some of these new fittings—for example the pleasing and effective forms of corner lights adapted for use on staircases—meet a distinct need. Others are purely decorative. We have no doubt that the appeal of novelty will lead to their being widely used. We hope, however, that the originators will not fall into the snare of attempting mass production. Conventional designs may be tolerated in the mass; grotesque and bizarre types soon become wearisome if constantly seen.

All these new fittings can be readily applied to existing interiors, for they are still "excrescences" that can be mounted on walls or ceilings. But the second manifestation of modernistic lighting, involving the incorporation of luminous surfaces in the architectural scheme of an interior, obviously demands the co-operation of the architect at an early stage in the design. This mode of lighting, which is merely an extension of the idea of "concealed lighting," has to our mind much greater possibilities—if only for the reason that it defies mass production. Each lighting scheme of this kind should be an individual effort. This style of lighting should find its first application in connection with new restaurants and places of entertainment which are always on the outlook for something new.

It will be interesting to watch the development of this new idea. Meantime Mr. Young deserves credit for his courage in adopting it in so wholesale a manner—the more so because he has recognized the scope for originality in this field and has engaged a special designer to furnish the craftsmanship necessary to evolve distinctive schemes.

* *The Illuminating Engineer*, Dec. 1928, p. 332.



Illuminating Engineering Society

FORTHCOMING EVENTS.

The attention of members is drawn to the next meeting of the Illuminating Engineering Society which has been arranged to take place in the lecture theatre of the Home Office Industrial Museum, Horseferry Road, Westminster, London, S.W.1) at 6-30 p.m. on Tuesday, January 22nd, when a paper dealing with " Colour and its Applications " is to be read by Dr. L. C. Martin. The next item will be the dinner and dance arranged to take place at the Trocadero Restaurant on the evening of February 13th, in celebration of the attainment by the Society of its twentieth anniversary. We hope that members and friends will make a special effort to be present on this important occasion. Shortly after the dinner there will be a meeting on February 19th, which is to be devoted to a general discussion on " Problems in Illuminating Engineering," and other interesting papers and discussions are promised in subsequent months. We understand that a welcome addition has been made to the original programme—namely, a paper by Dr. S. English dealing with some further properties of illuminating glassware. Those who recall the instructive and interesting paper read by Dr. English last year will look forward with pleasure to hearing him again.

Electric Light in the Poultry House

The value of artificial light in the poultry house in enabling the winter supply of eggs to be improved is, we believe, now generally agreed. But it is not often that we get definite information on this point. The experience of Mr. R. Borlase Matthews, clearly set out in a recent number of *The Electrical Age*, is therefore opportune. The author states that by giving the hens 12 to 14 hours of electric light daily an increase of from 10 to 50 per cent. in the winter egg supply was obtained. The total cost of the light was only 2½d. per hen (i.e., about the value of one egg). The effort, it is stated, does not strain the hens in any way; they merely revert to their natural practice in the subtropical countries from which they originated. Some practical hints on the lighting arrangements may be of value. Mr. Borlase Matthews suggests that lighting should commence in October and stop in March, and the hours of lighting should be *regular*. Birds should be allowed 10 to 11 hours' sleep. Lamps should be hung about six feet above the floor and the light directed, by suitable reflectors, on the feeding and scratching area. The intensity of illumination over this area should not be less than one foot-candle. One final recommendation (which might well be followed in other fields of lighting) may be noted: the lights should not be suddenly switched off, for hens cannot see in the dark. Some form of dimming arrangement, giving conditions that produce an artificial dusk and dawn, should be adopted.

Better Shop-Window Lighting

It is common knowledge that the lighting of the windows of leading stores has improved immensely during recent years. But, as was revealed in the instructive survey presented by Messrs. W. J. Jones and H. Lingard before the Illuminating Engineering Society a few years ago, it is chiefly in the case of the smaller shops in less important thoroughfares that defects appear. The campaign for better shop lighting undoubtedly has helped to bring about improvements. In the series of streets extending from Tottenham Court Road by way of Hampstead Road to the Archway Tavern, there are now quite a number of skillfully lighted windows to be seen, though many shocking examples still exist. Incidentally we may refer to one outstanding landmark on this route, the new Carreras factory, which is so effectively floodlighted from the front basement. The white surface of this building, decorated in colour on original lines, has a most striking effect, and it comes as a surprise to those who only knew this road before the new Carreras building was erected.

The Association of Public Lighting Engineers

At a recent meeting of the Council held at Birmingham the decease of Mr. Noah Wright (President-elect) was reported and received with regret. Steps were taken to fill the vacancy, the choice falling unanimously on Mr. S. B. Langlands, J.P., of Glasgow, the first President of the Association. The Council also considered afresh the invitation received at the Sheffield meeting from the Bournemouth Corporation for the Association to hold its Annual Meeting (1929) in their town, in view of the then President-elect being their officer. As the result of communications with the Corporation, the Council has decided to hold its next Annual Meeting and Conference there under the presidency of Mr. Langlands, also to hold an exhibition of public lighting appliances in connection therewith. The date is fixed for September 9th, 10th, 11th and 12th, 1929. Mr. Robert Beveridge, Lighting Inspector, City of Edinburgh, was added to the Council in the place of the late Mr. Wright. In connection with the exhibition of public lighting appliances, those firms wishing to participate should notify their assent to the Hon. Secretary, W. J. Liberty, 68, Victoria Street, London, S.W.1. The Council likewise decided to hold a general meeting of the Association at the British Industries Fair at Birmingham during the third week in February, 1929. Particulars of this will be issued later.

Obituary

WILLIAM CUNNINGTON

We record with regret the death of Mr. William Cunnington of " The Chase," Clapham Common, in his 81st year.

Mr. Cunnington, whose interest in the Illuminating Engineering Society was essentially that of an amateur, was one of its earliest members and, until recently, he was often to be seen at meetings where anything of an experimental nature or any new development was being discussed.

He had followed very closely the developments in domestic lighting when flat-flame burners gave place to the Argand and the Wenham lamp, and he used to claim to be the first person in Clapham to have a Welsbach incandescent burner, when the burner cost a guinea and spare upright mantles could be obtained at 2s. 6d. each. He was also interested in photometry and for one of the meetings of the Society constructed a rough model of an illumination gauge of a type that was later developed into a practical instrument.

Light in the Service of Mankind

A Striking Exhibition in Sweden.

Each month one receives some indication of the remarkable development in illuminating engineering abroad. The latest instance is afforded by the exhibition entitled "Light in the Service of Mankind," recently organized in Stockholm, which is briefly described by Dr. Gerhard Schmidt in a recent issue of *Licht und Lampe*. Whereas in Great Britain and the United States, France and Germany, more or less permanent demonstrations of centres have been in existence for some years, the exhibition referred to above, which took place during September 1st to 23rd, appears at the first attempt to demonstrate the benefits of good lighting in Sweden. The exhibit, however, seems to have been planned on extensive lines. The historical sequence of advances in illuminants was illustrated by a comprehensive series of lamps using oil, gas, acetylene, etc., and about 160 electric incandescent lamps of different types, varying in size up to 10,000 watts, were on view. Experiments were devised to illustrate fundamental principles in illumination, e.g., the influence of illumination on visual acuity, effects of glare, production of shadows, etc. The section of the exhibition devoted to practical applications of light was staged in a large circular room illuminated by the recently introduced "architectural" methods. Round the circumference model dining rooms, bedrooms, kitchens, etc., were lighted by the best modern methods, and there were also demonstrations devised to contrast the effects of good and bad lighting in offices, factories and schoolrooms. Five model show windows were illuminated in a tasteful manner. A particularly interesting exhibit was a model street, where all appliances needed for shop-window lighting, traffic signs, illuminated house numbers, etc., were shown in actual operation. Other applications illustrated included light therapy, light projection and the use of light in horticulture. During the period of the exhibition a number of important buildings were floodlighted. Stockholm is to be congratulated on this enterprising departure.

Lighting for Aviation

A recent contribution to the *Electrical World* by Mr. E. G. Hery gives a striking impression of the vast development in the use of light for aerial navigation in the United States. In that country conditions are somewhat different from those applying to our own air service. Our cross-channel and other routes are relatively short, and require few lights; on the other hand the tracks of prolonged journeys to Africa, India and Australia can hardly be mapped out by luminous means. In America, however, there are many long overland routes in regular operation. The number of miles of "lighted airway" has increased from 3,149 at the end of 1926 to an estimated figure of 7,571 for 1928, and the programme in hand involves the lighting of 5,793 additional miles. It is believed that the airport lighting load for 1928 will exceed 200 million kw.-hours, and for the same period about 6 million kw.-hours will be expended on airway lighting. Airway lighting is at present accomplished mainly by beacons at distances of 10 miles, each mounted at a height of 50 feet and furnishing a beam-candlepower of approximately two million. The beams rotate six times a minute. In 1928 674 such beacons were in use. Other types of beacons are being investigated, and provision has to be made for other special lighting devices, e.g., for the illumination of aerodromes and wind-direction indicators, and to indicate boundaries and obstructions. By June, 1928, about 1,600 airports were estimated to be in operation and the average rating is 25 kw. per airport. Truly the use of light in aerial aviation is becoming quite a considerable industry!

Festival Lighting in Germany

The same issue of *Lux* contains the impression of M. Chappat on the recent festival lighting in Berlin. Some pleasing examples of floodlighting are included, and the variety of luminous signs contrived for the occasion is remarked upon. It is interesting to note that the normal consumption of energy for lighting in Berlin was exceeded by 22,000 kw. daily during the progress of the fête.

As mentioned in our last issue, many other cities in Germany have followed the example of Berlin in arranging "Fesivals of Light." Some results of the 1927–28 shop-window lighting campaign in Germany are now reported. This, too, was conducted simultaneously in many cities, and in most cases the campaign seems to have led to a sustantial improvement in the standard of window-lighting.

Street Lighting in Detroit

Considerable interest has been aroused by the new lighting of the Washington Boulevard in Detroit, a night view of which has recently been published in the *Electrical World*. This wide thoroughfare is illuminated by two rows of cluster units. The posts are 32 feet in height and carry five 1,000-watt lamps in diffusing globes. Approximately 2,000 lumens per linear foot of street frontage is provided, which is stated to be 20 times the amount of light previously available! Public lighting engineers in this country must contemplate with a certain degree of envy advances on such a spectacular scale. There is doubtless much to be said for this mode of lighting by the aid of clusters of diffusing units, which enables a high illumination to be obtained with a minimum of glare. We commend this example to the notice of those who have been agitating for an improvement in the lighting of the Victoria Embankment in London, a site which would well repay lighting on a dignified and impressive scale.

Lighting for the Inspection of Polished Surfaces

Under this title a simple but convenient device was recently described by Mr. J. M. Ketch before the Illuminating Engineering Society (U.S.A.). The accurate examination of polished surfaces for their two most important qualities—colour and absence of pitting—is difficult by ordinary lighting. Such surfaces naturally reflect all bright points of light, and one merely sees images of light sources. What is needed is an illumination proceeding from an extensive uniformly bright surface of moderate luminosity—say, 2 to 5 candles per square inch. The author meets this requirement by mounting the reflector within a cubical box with a whitened interior illuminated by concealed lamps. Conditions resembling those in an Ulbricht sphere are then obtained. If the reflecting surface is viewed through a window any abnormal coloration is quickly seen and flaws and scratches are evident.

TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

The Application of Electric Lamps to Advertising

(Proceedings at the meeting of the Illuminating Engineering Society held at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London, W.C. at 6-30 p.m. on Tuesday, December 11th, 1928.)

A MEETING of the Illuminating Engineering Society was held at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London, W.C., on Tuesday, December 11th, 1928, THE PRESIDENT (Mr. C. C. Paterson) presiding.

Members assembled at 6-30 p.m., when light refreshments were provided, and the meeting commenced at 7 p.m.

After the Minutes of the last meeting had been taken as read, the Hon Secretary read out the names of applicants for membership, which were as follows:—

Ordinary Members—

Denoon, D. G.....Technical Representative of Messrs. Callanders Cable & Construction Co. Ltd., 2, Surrey Street, Strand, London, W.C.2.

Davson, Cyril W.....Engineer, 42, Lansdowne Cresent, London, W.11.

Taylor, V. W.....Sales Manager of Messrs. Dualite Ltd., 420a, Uxbridge Road, Shepherd's Bush, London, W.12.

Tapsfield, A. S.....Inspector of Public Lighting, Public Health Department, Guildhall, London, E.C.

Country Members—

Collom, F. W.....Secretary of Messrs. Hays Glue Co., Ltd., 6, Surrey Street, Portsmouth.

Marsh, R. G.....Fittings Engineer, City of Birmingham Gas Department, 19, Noel Road, Edgbaston, Birmingham.

Rogers, R. G.....Chief Superintendent, Fittings Department, City of Birmingham Gas Department, Council House, Birmingham.

Sustaining Members—

Messrs. Allom Bros., 15, George Street, Hanover Square, London, W. (*Representative*—Mr. G. F. Allom.)

Messrs. The Edison Swan Electric Co. Ltd., 123-125, Queen Victoria Street, London, E.C. (*Representative*—Mr. J. W. Elliott.)

Messrs. Holophane Ltd., Elverton Street, Vincent Square, Westminster, London, S.W.1.

The HON. SECRETARY explained that the country members whom they had the pleasure of welcoming were the first instalment of what he hoped would prove a substantial addition as a result of the meetings organized in the provinces. He hoped that any members who had friends in the Birmingham, Manchester, Newcastle and Glasgow areas would bring the Society before their notice and explain the new arrangement enabling country members to join on the same terms as Associates.

THE PRESIDENT then called upon Mr. H. Lingard to read his paper entitled "The Application of Electric Lamps to Advertising" (see pp. 6 to 13). The paper contained an instructive survey of the development of electrical advertising in this country and the factors affecting sign design were analysed in considerable detail. Such matters as the effect of "irradiation," candle-power of adjacent sources, background brightness and district brightness were considered, and the relations connecting maximum viewing distance with minimum letter height and maximum lamp spacing for a continuous line of light were illustrated by diagrams. The final section of the paper dealt mainly wtih signs for short-distance viewing, enclosed-lamp signs, shop-fascia lighting, etc., and in conclusion the author emphasized the numerous demonstrations of special types of signs assembled for the meeting, which were witnessed with great interest by those present.

THE PRESIDENT in opening the discussion complimented Mr. Lingard on his very useful paper, and on the trouble he had taken in arranging so many striking demonstrations. In the subsequent discussion Dr. J. W. T. WALSH, Mr. A. CUNNINGTON, Mr. A. W. BEUTTELL, Mr. WOOLNOUGH, Mr. T. E. RITCHIE, Mr. L. E. BUCKELL, Capt. W. J. LIBERTY, Mr. J. S. DOW, Mr. J. ECK, Mr. C. E. GREENSLADE, Mr. W. J. JONES, Mr. H. LONG and Mr. J. L. H. COOPER took part. A number of technical points were raised in regard to the data presented by Mr. Lingard, such as the influence of irradiation and the part played by brightness in determining legibility. Attention was drawn to the increasing opportunities for the use of electric signs not only for advertising but for the purpose of giving information; the equipment of railway stations with informative notices and the provision of illuminated names and numbers for houses were mentioned as special examples of such opportunities. Yet another field of usefulness for the illuminated sign—as an aid to the guidance and control of traffic—was mentioned by Capt. W. J. Liberty. Mr. H. Lingard replied briefly to the various points raised, promising to do so more fully when the discussion was put into print.

At the conclusion of the meeting many of the audience took the opportunity of examining more closely the various signs, a number of which were new to those present.

On the motion of the President a very cordial vote of thanks was passed to Mr. Lingard for his interesting paper.

It was announced that the **Next Meeting** of the Society would be held in the lecture theatre of the Home Office Industrial Museum at **6-30 p.m.** on **Tuesday, January 22nd,** when a paper dealing with **"Colour and its Applications"** would be read by Dr. L. C. Martin.

The Application of Electric Lamps to Advertising

By H. LINGARD

(*Paper presented at the Meeting of the Illuminating Engineering Society, held at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, W.C., at 6-30 p.m., on Tuesday, December 11th, 1928.*)

SUMMARY.

In this paper an attempt is made to survey some of the factors underlying the successful use of electric lamps in advertising and to indicate the scope which exists for future development in this field. The effect of such phenomena as irradiation has been discussed in some detail with a view to establishing their importance in the design of electric signs which are intended to exert a long-range appeal. Special stress has been laid upon the development of signs which are designed for view at short distances, since there appear to be special opportunities in this country for advertising devices completely fulfilling the requirements of this class of work.

Introduction.—At no time in the history of this country has advertising attained such a degree of public prominence and importance as that which it holds at the present time. Advertising in some form or other has, of course, existed since the earliest times, but electrical advertising, as such, is necessarily a recent development and dates from the introduction of the first incandescent electric lamps in 1878.

During the last few years the importance of salesmanship in all its branches has become more fully recognized; even in this country the whole science of sales organization is now looked upon as a subject of almost national importance. Advertising as the silent sales force, and electrical advertising as the most effective and spectacular form of advertising, have correspondingly attained a more prominent position in the manifold activities of commerce. In addition, the public has been educated to show a greater appreciation of advertising matter. This has been largely brought about by the steady refinement in the forms and methods adopted by enlightened advertising experts. A manifest improvement is evident when one contrasts the crude advertising matter of pre-war days with the psychologically sound arguments and illustrations of the present time.

As a mass, the public in any country will generally react in a similar manner to certain forms of illustrative appeal, but the British public possesses a peculiar national pride and independence of thought which necessitates a considerable degree of caution on the part of the advertiser, and, in general, compels him to adopt truth and refinement in his advertising if he wishes to have and to hold the favour of the man in the street.

The forms of electrical advertising devices which have developed in the larger towns of this country, and particularly in certain centres of London, will, in general, be found to comply with the above fundamentals, and if a vote were taken among a representative group of citizens it would doubtless be found that the majority of them possess a considerable pride in the ingenious and attractive electric signs which do so much to add life and gaiety to the dullness of our winter streets. On the other hand, it should be realized that in this country only a small part of the possible field of advertising has been exploited, and that a rapid development and extension of all forms of electrical advertising can proceed for many years without any fear of saturation point being reached. The types of electrical advertising devices at present on the market, together with the many forms which will doubtless be evolved in the future, offer enormous scope for widespread application in commercial work; the possibilities are not by any means limited to the needs of people having something to sell, but extend to almost every section of the public. Thus I believe that, in the course of a few years, every house front will be equipped with an illuminated designation sign indicating either the number or the name of the dwelling.

The Scope of Electrical Advertising.—Electrical advertising, in common with everything which grows, has necessarily reached its existing form as a result of the impress of external conditions. In this country, at any rate, there exists—and always has existed during the period in which electrical advertising has developed—a wide gulf between what the advertiser would like to do and what the advertiser is allowed to do. The restrictions imposed upon electrical advertisers by local authorities have undoubtedly retarded progress to an enormous extent, and development is still severely handicapped by out-of-date legislation. On the other hand, it must be conceded that these same restrictions have had a certain beneficial effect in eliminating crude and annoying forms of electrical advertising. In other words, it may be said that many of the forms of electrical advertising at present in use are of a refined nature, and, by force of circumstance, represent the best that the designer can achieve without materially interfering with or despoiling the intrinsic beauty of the surroundings.

In other countries where electrical advertising has developed in almost unfettered freedom the progress made has resulted in something very nearly approaching saturation, particularly in the more densely populated areas, while the devices which are employed to make the signs effective after dark frequently result in an appalling ugliness during daytime.

These factors, namely, the mentality of the public and the restrictions which have been imposed, together with the characteristic topography of our cities, have necessarily resulted in differences in the requirements of many forms of electrical advertising devices in Great Britain as compared with, say, the United States. For example, in the case of the larger forms of outdoor signs, the requirements of maximum and minimum distances of view are somewhat different from those of the U.S.A., since, owing to the prohibition of sky signs in this country, the lower building height and the winding nature of our streets, the average distance from which electric signs are visible is naturally somewhat less.

Broadly speaking, it is possible to classify electric signs which are used out-of-doors into two classes, namely, signs to be viewed at long distances and signs to be viewed at a short distance only; these types may be conveniently designated as "long-range" and "short-range" signs.

The fundamental factors which affect design are somewhat different for the two types of signs. In general, it is the practice to employ signs with exposed lamp construction for long-range work, while signs with enclosed or concealed lamp construction are generally found more satisfactory for short-range work. It is proposed, first of all, to deal with the factors affecting the design of long-range signs, since this class of display lends itself more to accurate analysis.

Factors Affecting Sign Design.—(1) *Irradiation:* The phenomenon of irradiation plays an important part in the designing and effective operation of all signs employing exposed-lamp construction, since, unless this factor is taken into account, the sign is liable to lose either legibility or appeal throughout the range of its viewing distance.

If the lighted filament of a single clear lamp, for example, in a sign letter of trough construction, is viewed from a distance of three feet, it appears only a little larger than the unlighted filament. As the observer walks away from the sign, however, the filament parts seem to coalesce into a ball of light which increases in size until it entirely fills the bulb, and then continues expanding as the distance increases until it appears

larger than the trough itself, and finally, if viewed from a distance of a mile, the spot may actually appear about five feet in diameter.

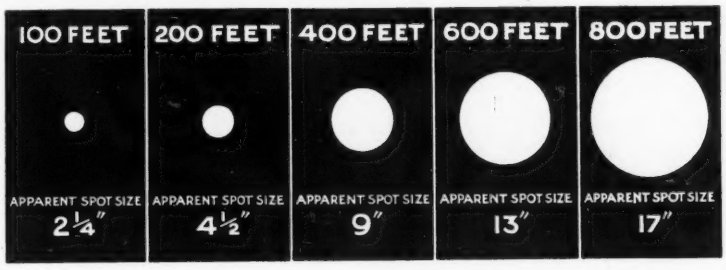


FIG. 1.—Apparent Sizes of Single Lamp against Black Background at Various Distances.

This phenomenon, by which bright objects appear larger than dark objects of the same size, is known as "irradiation," and is characteristic of the functioning of the eye. The eye, owing to its construction, cannot resolve objects which subtend angles of less than about one minute of arc; if details lie closer together their images strike the same unit of the retina, which is then stimulated as though only one image fell upon it. However, although not resolvable, the object may still be visible for a great distance because of its brightness. Thus a light source of 1 candle-power may be seen for 1.7 miles. The filament of a sign lamp, when viewed from increasing distances, will form decreasing images on the retina, but the visual impression of size will remain almost constant. Therefore, relative to the larger objects in the vicinity, which apparently decrease in size, the apparent area of the light source increases in size. This effect is shown in diagrammatic form in Fig. 1, where the relative apparent sizes of a single light source are given for various distances.

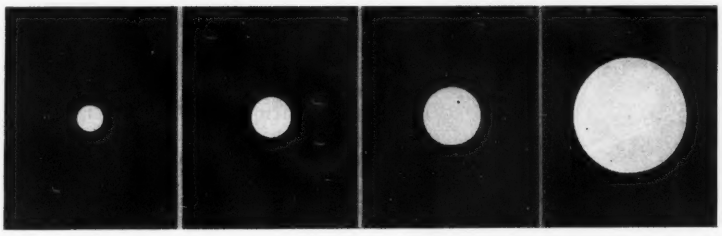


FIG. 3.—Relative Apparent Sizes of Single Lamp at 1,000 feet against Backgrounds of Various Brightnesses.

The effect of irradiation in the case of luminous objects, such as electric lamps, is accentuated or modified by the following conditions:—

(*a*) *Viewing Distance.*—In general, it may be stated that the greater the viewing distance the greater is the apparent magnification of the light source.

(*b*) *Candle-power of Source.*—Fig. 2 indicates the relative size of clear lamps of different wattages under fixed conditions; it will be seen that the higher the power of the lamp the greater is the irradiation obtained.

(*c*) *Candle-power of Adjacent Light Sources.*—The effect of bright luminous sources in the immediate vicinity of the one under direct consideration is to diminish the irradiation obtained.

This factor is obviously an important one in the case of electric signs, since it indicates the reaction of the lamps in the sign upon each other. In the case of the large sign this factor will have the effect of greatly reducing the irradiation, while in the case of a single light source isolated from others the effect of irradiation is at a maximum.

(*d*) *Background Brightness.*—The contrast afforded between the light source and its background also exerts an influence upon the irradiation produced, the effect being at a maximum when the immediate background is absolutely black, while even small increases in the background brightness will result in considerable reductions in the irradiation effect, as is approximately indicated in Fig. 3.

(*e*) *District Brightness.* — The general brightness of the surrounding district, taking into account the street and shop lighting and all other forms of illumination which are competitive to the electric sign, will also influence the irradiation, the irradiation obtained being at a maximum when this competing illumination is absent.

The practical value of determining the irradiation obtained under given conditions is to enable the designer of long-range exposed-lamp signs to pre-determine the appearance of the sign before actual construction.

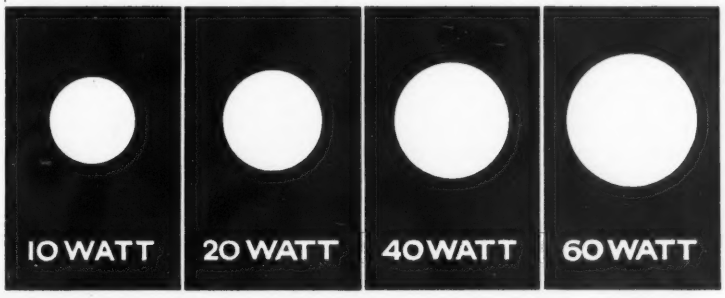


FIG. 2.—Relative Apparent Sizes of Various Wattage Lamps at 1,000 feet against a Black Background.

The correct spacing of lamps in any given sign, in order to obtain the best results at both maximum and minimum viewing distances, will naturally depend, in the case of long-range signs, on the amount of irradiation which can be obtained, since it is always the aim of the sign designer to obtain, as far as possible, a continuous line of light. The effect of four different lamp spacings on the appearance of a given stroke is shown in Fig. 4, which indicates the light sources as they appear to the eye under the effect of irradiation.

It is always important, however, for the designer to bear in mind that the sign must be designed for good legibility at the minimum viewing distance as well as at the maximum distance, and the range of distances within the area of effectiveness

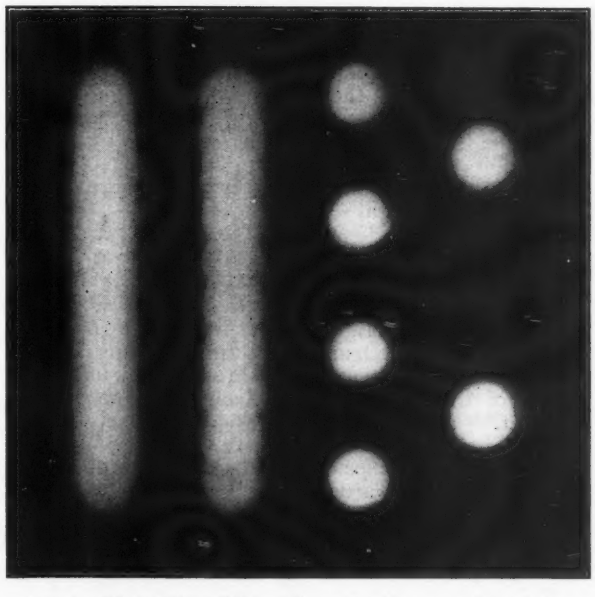


FIG. 4.—Effect of Four Different Lamp Spacings on a given stroke.

are obviously those which should receive prime consideration when designing for legibility and appeal. Fig. 5 shows one method of defining the circle of effectiveness for a given sign. It is mainly to assist in better legibility at shorter viewing distances that the channel- or trough-type lettering has been developed for use with the exposed-lamp construction. The obvious function of troughing is to confine the light of the lamps to the stroke of the letter, and thereby to eliminate the spilling of light on the background, and by this means where the viewing distance is relatively short, or where the sign is viewed obliquely, the legibility is maintained where otherwise it would be lost.

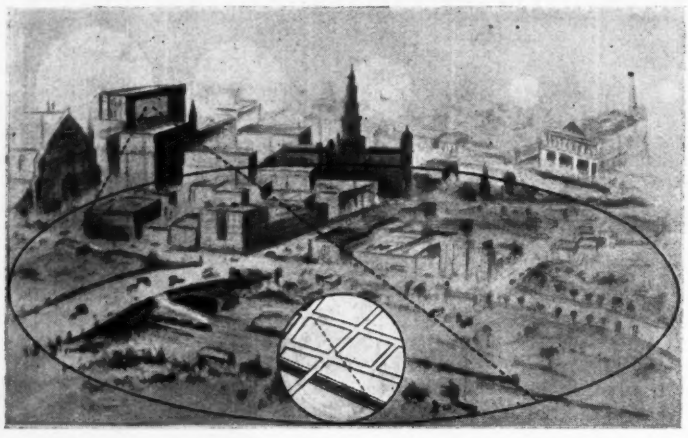


FIG. 5.—Diagram showing Circle of Effectiveness for a given Sign.

(2) *Size of Sign.*—The size of lettering most suitable for use in exposed-lamp signs will obviously depend upon the maximum viewing distance at which legibility is desirable. The effective legible range of any sign is dependent to some extent upon the amount of irradiation obtained, since this phenomenon may easily bring about illegibility, due to the overlapping or confusion of letter strokes. This is indicated in Fig. 6, the diagram being based upon the fact previously noted that the average eye can distinguish between two adjacent lines if these subtend an angle at the eye of at least one minute of arc. In practice, however, the sign is usually called upon to have a clear definition during daylight, which will usually necessitate larger sizes of letters than those indicated by night-time requirements. A rough method of obtaining the minimum letter height which has been found satisfactory in practice is to divide the maximum viewing distance by 500, i.e.,

$$\text{Minimum letter height} = \frac{\text{Maximum viewing distance}}{500}$$

This would give a letter height of 2 feet where the maximum viewing distance is 1,000 feet.

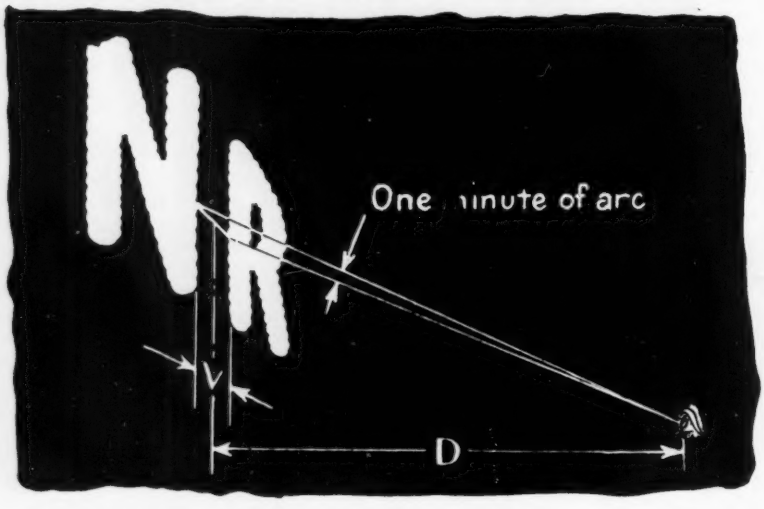


FIG. 6.—Influence of Irradiation on Legibility.

(3) *District Brightness.*—Apart from the influence of district brightness on irradiation in the case of signs which are viewed from considerable distances, the computation of total luminous output of the sign will be influenced by the competitive illumination, and where extremely bright surroundings exist or where the sign will be called upon to compete with other bright signs in the vicinity the wattage must be increased to ensure the sign having the necessary advertising value. Under these conditions, it is difficult to lay down any hard-and-fast rules for the computation of total wattage in any sign, but where the competition is considerable the wattage must be increased over and above the figures obtained from the ordinary methods of design, while, in addition, many other methods of obtaining distinction and attraction, such as the use of contrast colours or simulated motion, obviously can be resorted to, and frequently will be laid down as definite requirements by the advertiser before the sign is designed.

The Method of Design for Exposed-lamp Signs.—It is proposed to deal under this heading with the graphical method for the design of exposed-lamp signs, developed by Messrs. W. C. Brown and F. E. Carlson, based on data collected by C. A. Atherton,* taking into consideration the factors discussed under the previous headings. Their work has been carefully studied, and is presented here in a form adapted to British practice.

District Brightness Factor.—It is necessary in the first place to classify the districts in which a sign may be displayed in order to ascertain the district brightness factor.

Table I shows the classification of districts adopted for British conditions.

To estimate the effect of the background brightness and the total wattage of the sign to enable the

* Engineering Department, National Lamp Works of General Electric Co., Cleveland, Ohio, U.S.A.

TABLE I.

DISTRICT LIGHTING FACTORS.

Description of District.	Factors.
Very bright centres in large cities such as, Piccadilly Circus, Leicester Square etc.	1
Main streets in fairly large cities and well lighted shopping centres.	2
Centres of smaller towns and surburban districts.	3
Isolated displays with no appreciable competitive lighting.	4

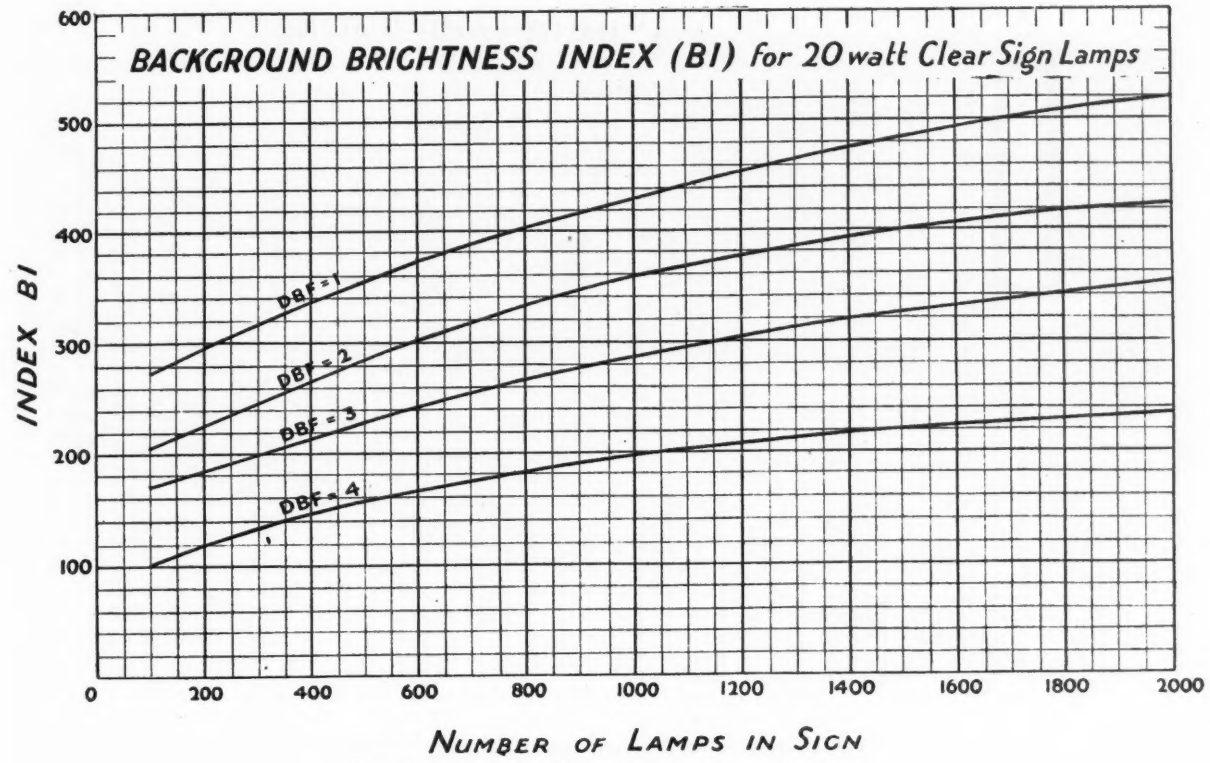


FIG. 7.—Background Brightness Index for 20-watt Sign Lamps.

design to be carried out on a graphical basis an intermediate factor designated "brightness index" (BI) must be employed, which will vary for different district brightness factors, and also with the total number of lamps in the sign. It is necessary, therefore, to make some rough estimate of the total number of lamps required, but some degree of inaccuracy in this calculation is not serious, as it will be eliminated by final recalculation. Fig. 7 shows a curve of BI factors for 20-watt clear sign type lamps with the four district brightness-factor curves plotted to a base of number of lamps in the sign.

Letter Height.—It is necessary to estimate the minimum letter height to enable complete legibility at the maximum viewing distance. Fig. 8 gives the letter-height recommendations for viewing distances up to 8,000 feet with various BI factors. This curve is based on the requirements of ordinary block lettering, employing a single row of lamps.

Lamp Spacing.—The desirable lamp spacing for giving a continuous line of light should be based on the minimum viewing distance, and this can be obtained from the curves in Fig. 9, where the lamp spacing is given for different BI factors.

Total Number of Lamps.—Having obtained the letter height and lamp spacing necessary, the number of lamps in the sign can then be found by the following equation:

$$\text{No. of lamps} = \frac{\text{letter height (ins.)}}{\text{lamp spacing (ins.)}} \times 2\tfrac{1}{2} \times \text{No. of letters.}$$

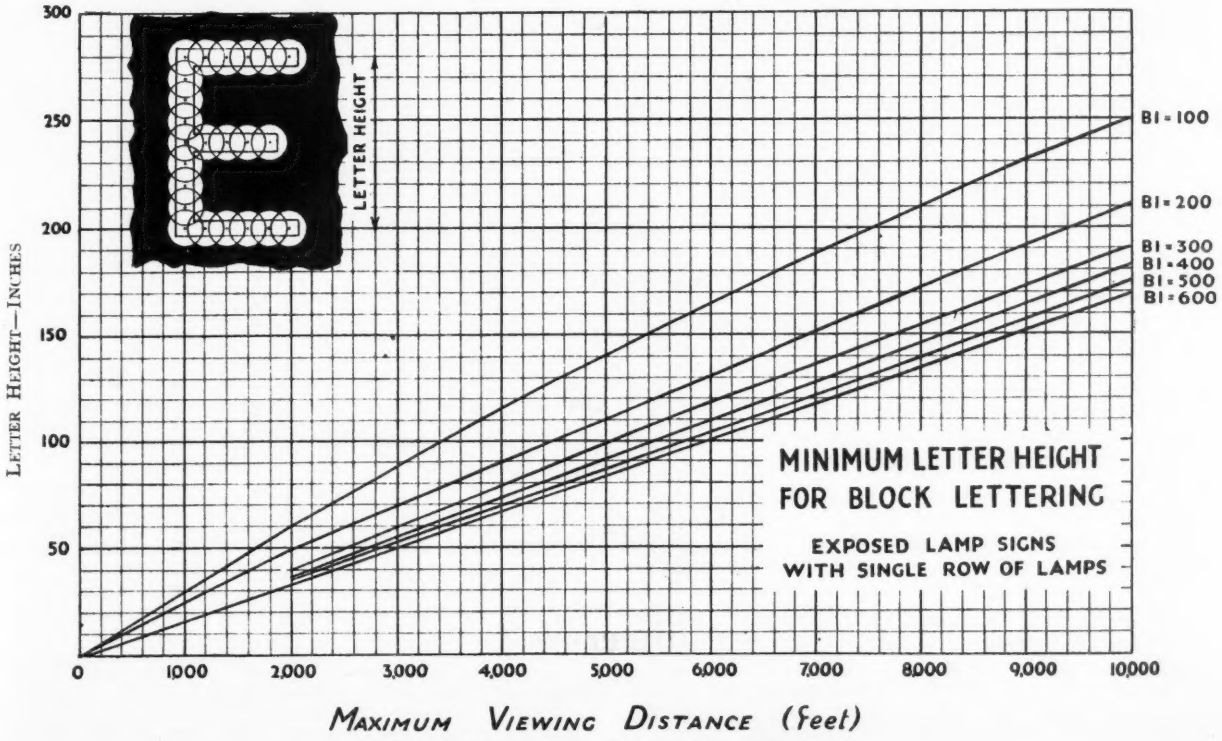


FIG. 8.—Minimum Letter Height for Block Lettering.

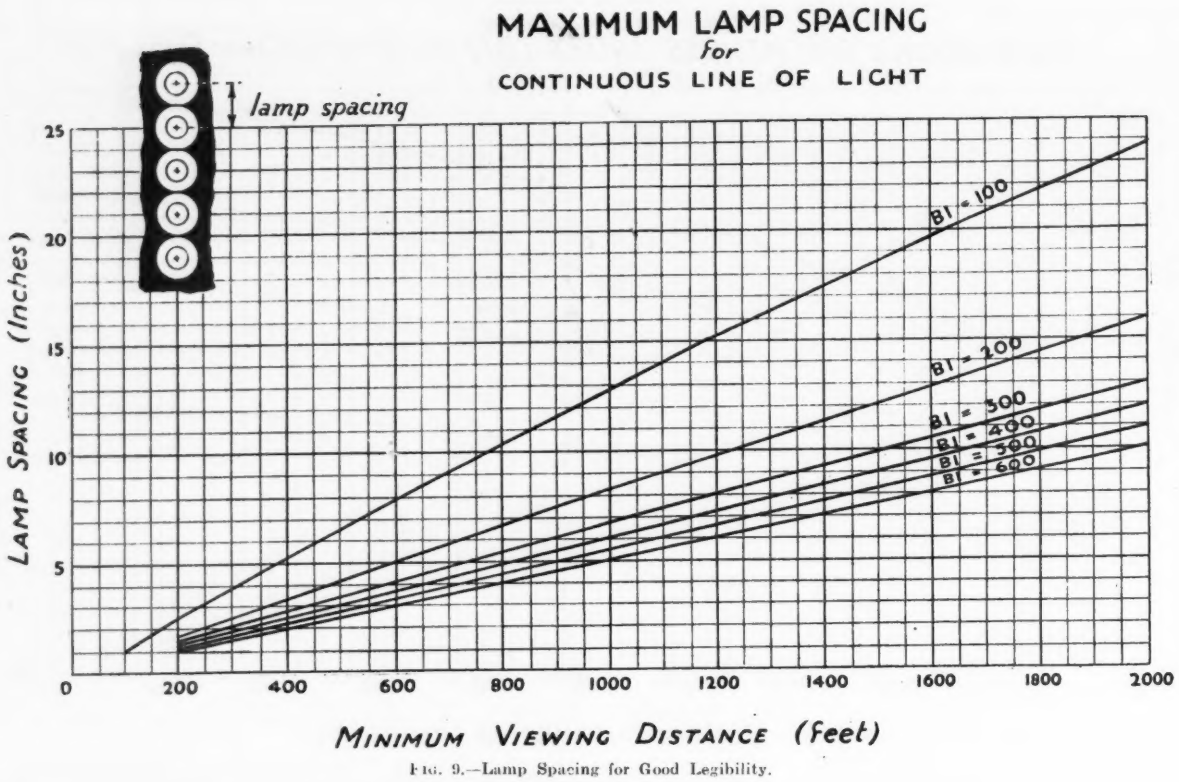


FIG. 9.—Lamp Spacing for Good Legibility.

The total number of lamps found by this calculation will probably be different from that originally estimated and may necessitate a recalculation to obtain the final result.

Example.—The application of this method of design can probably be best indicated by means of the following example:—

An exposed-lamp sign with plain block lettering, to read BRITISH LAMPS, is to be erected at the fourth-storey level of a building in an outlying district of a large city. There are no other large buildings or signs near by. The display is intermittently visible along a main road from a distance of 5,000 to 500 feet, and should be legible from these points. It will also be visible from numerous other points well within this 5,000-feet maximum viewing distance.

Requirements.—

(*a*) Size of letters for legibility at 5,000 feet under normal atmospheric conditions.

(*b*) Spacing of lamps along letter strokes to present smooth appearance at 500 feet.

(*c*) Total number of lamps.

The surroundings must first be classified as to district brightness factor (see Table I). The district brightness factor in this case can be taken as 4. It is now possible to make some estimate of the total number of lamps in the sign so that the Brightness Index (BI) can be obtained. A sign to be seen several thousand feet is necessarily of fairly large proportions, and it may be assumed for the present purpose that the sign will require about 1,000 lamps. Following the curve DBF = 4, in Fig. 7, we have a BI factor of 200.

Letter Height.—Since the sign will embody block lettering, the curves in Fig. 8 should be used. Following the curve BI = 200 to the intersection of the 5,000-feet line which represents the maximum viewing distance, we obtain our minimum letter height of 110 inches.

Lamp Spacing.—Referring to the curve Fig. 9 of maximum lamp spacing, based on minimum viewing distance, which is the problem is 500 feet, we have a BI factor of 200, which gives a maximum lamp spacing of 4 to 4¼ inches; the total number of lamps in the sign is then found by substituting in the equation:

$$\text{No. of lamps} = \frac{\text{letter height}}{\text{lamp spacing}} \times 2\tfrac{1}{2} \times \text{number of letters}$$

$$\frac{110}{4\tfrac{1}{4}} \times 2\tfrac{1}{2} \times 12 = 776$$

As this result is different from the original estimate, it warrants recalculation, which should now be made on the basis of 776 lamps.

Re-check BI factor = 180
,, Letter height = 115
,, Lamp spacing = 4¼ inches
,, Total number of lamps in sign = 767, say 770.

This result is close to the first calculated number of lamps, and a recalculation will leave the result unchanged.

Predetermination of the Appearance of the Light Pattern.—The method of predetermining the night appearance to the average eye of a proposed display at some specific viewing distance which can be called a "spot study" may be found of use in the design of exposed-lamp signs. Spot studies may be made by the use of confetti pasted on the black paper. A sketch should be made up to such size that when the confetti is pasted on the outlines of the letters or figures the result is a clear picture. The confetti will bear some scale relation to the estimated apparent diameter of the lamps under the given conditions. The diagram should then be viewed at a distance which bears the same scale relation to the maximum viewing distance of the sign, and the result will then indicate approximately the appearance of the actual installation. Fig. 10 shows the result obtained from such a study in the case of the letter "R."

In dealing with complicated patterns, trade marks, and designs, the spot study is of especial value to the designer, for while it may be possible to determine from a graphical method of design that the various lines of light can be differentiated it is usually impossible to visualize the lighted pattern as a whole unless a spot study is made.

The above considerations are obviously limited to those signs which are called upon to operate over a considerable distance, and since in this country there is at present a limited number of sites for the long-distance

sign, it is considered desirable to deal to some extent with those signs which have been evolved for viewing at relatively short distances.

Signs for Short Distance Viewing.—The requirements of illuminated advertisements which are intended to be effective when seen from such short distances as across an ordinary city street are necessarily very different from those which have been outlined for the larger types of exposed-lamp signs. Although it is still common practice to employ exposed-lamp construction for this close-range work, and it is essential to do so for special applications such as animated signs, many types of effective signs in which lamps are concealed and in which the lighted pattern is more or less continuous have been evolved in the last few years.

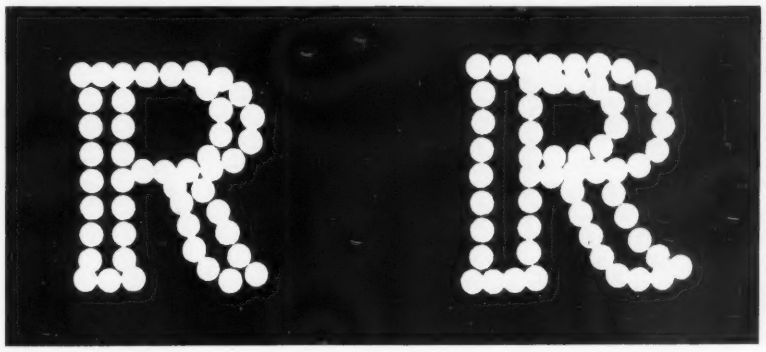


FIG. 10.—Spot Study for Letter "R."

Complete legibility is essential in signs for this purpose, even when viewed at distances of only a few feet, while the design should be such that it compels the attention of the passer-by, and effectively stands out from all competitive lighting. Probably the most important requirement of all in connection with this type of sign is that it should be of good appearance both by night and by day, since it is usually mounted on the front surface of the building, and must not in any way detract from or despoil the architectural features.

Enclosed Lamp Signs.—The enclosed-lamp sign, as its name implies, usually consists of a box or cabinet housing lamps which are arranged to illuminate a translucent panel (usually of opal glass) upon which advertising matter is arranged.

The popularity of this type of sign is due, in a large measure, to its more pleasing daytime appearance when compared with the exposed-lamp type of sign. The smooth even lines of the strokes of the pattern also lend themselves to building architecture which is quiet and dignified.

The brightness of the luminous elements of enclosed-lamp signs is necessarily very much lower than that obtained from signs employing exposed lamps, so that when an appeal is to be made to passers-by at a distance great enough to enable the spots of light in an exposed lamp sign to merge into single smooth lines there is no advantage in placing diffusing glass over the lamps.

It is a general rule not to employ enclosed-lamp construction for signs whose letters exceed 18 inches in height, while exposed-lamp signs to be satisfactory should not be used for signs with less than 18-inch lettering.

There are, of course, many exceptions to this rule, and enclosed-lamp signs have been made with letters as large as 6 feet in height, because in those cases where an artistic daylight appearance is imperative enclosed-lamp signs of large dimensions become essential regardless of cost.

Accessibility of the lamps and luminous surfaces is very desirable in signs of this construction; otherwise cleaning, which is so important, will be neglected, and lamp replacement will become unnecessarily difficult. It is also very important that enclosed-lamp signs should be so designed that the impression of bulkiness is avoided, since a sign which has the appearance of a heavy metal box will rarely improve the daytime appearance of any site. By careful design, however, much can be done to conceal the depth of the sign, and thereby give emphasis to the most important element, namely, the advertising surface.

Letter Size for Enclosed-lamp Signs.—The minimum letter height which should be used in enclosed-lamp signs can be obtained approximately from the following equation:—

$$\text{Letter height in feet} = \frac{\text{maximum viewing distance in feet}}{250}$$

but this figure should only be adopted after careful consideration of the appearance presented by letters of such a size when viewed from short distances.

Lamp Spacing and Wattage.—The desirable average brightness for enclosed-lamp signs depends, as in the case of exposed-lamp signs, to some extent upon the surrounding and background illumination.

The chief requirement from a lighting point of view in enclosed-lamp signs is that the luminous surface should be evenly and sufficiently lighted, and it is obviously possible to obtain the desired effect by a number of different lamp arrangements.

It is, however, desirable to take advantage of the higher efficiency obtained from the larger lamps by using the highest wattage lamp that can be employed without seriously impairing the brightness uniformity of the luminous surface.

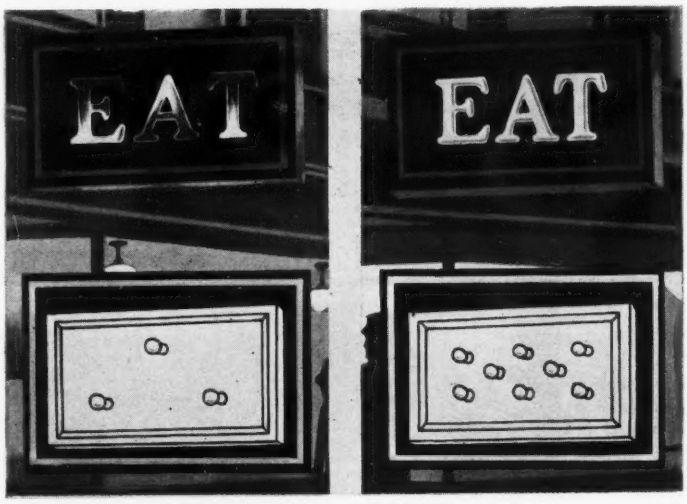


FIG. 11.—Effect of Lamp Spacing in Enclosed-lamp Sign.

In practice, for the ordinary type of enclosed sign seven to nine inches in depth, the centres of the lamp filaments should not be separated by distances in excess of six inches. Too meagre a lamp spacing will easily spoil the night appearance of even the best sign. The comparison shown in Fig. 11 clearly indicates the contrast between poor and recommended practice.

Having obtained even illumination of the luminous surface by spacing the lamps on six-inch centres, the requisite degree of brightness can be obtained by choosing a lamp of suitable wattage. The 60-watt lamp is the largest that can be safely employed for the average enclosed-lamp sign, and when, therefore, the distance of viewing or the surrounding brightness are so great as to require more than 60-watt lamps on six-inch centres, the lamp spacing should be reduced rather than the lamp size increased. Gasfilled lamps will generally be found to give best results in enclosed-lamp signs, owing to the whiter

character they impart to the luminous surface, giving a more attractive appearance and increasing contrast.

Colour, if used in enclosed-lamp signs, is much more effective if the colour medium is incorporated into the sign itself rather than being obtained by the use of colour-sprayed or dipped lamps; although under certain conditions the latter method may be preferable, since it enables an easy change of colour to be made by merely changing the lamps.

Silhouette Signs.—Signs employing a silhouette construction in which the lamps illuminate a background on the totally indirect principle—so that the letters stand out in silhouette by night against an illuminated background—are coming into favour for the smaller types of displays, particularly for shop-fascia lighting. One design employs a narrow illuminated border to the silhouette letter, while another type employs a fairly large background. In all silhouette designs at present on the market there is a commendable tendency to make the lamps very readily accessible for cleaning and replacing. It is also worthy of note that all the more recent forms of short-range signs have an exceptionally good daylight appearance.

Shop-fascia Lighting.—An enormous field of application exists for the types of signs discussed under the preceding headings for short-distance viewing, since the majority of enterprising shopkeepers, once convinced of the value of illuminating their fascia, will be only too anxious to employ the most effective and arresting of all methods, namely, that of using some form of electric sign.

Almost every description of sign can be adapted for this work, from flashing exposed-lamp signs to the simple floodlighting of the painted fascia by trough units.

There is, however, a decided preference for concealed-lamp signs—a type which it is desirable to encourage. The simplest and most straightforward method of lighting is undoubtedly the system which is likely to appeal to the mass of shopkeepers, and which stands the best chance of being almost universally adopted.

Correctly designed trough fittings over the top of the existing fascia will give adequate illumination under average conditions if provided with one 40-watt lamp per foot run, and if the fascia lettering is of the raised type the effect may be quite pleasing, provided that the light from the troughing is carefully screened from the eyes of passers-by.

A development of this system has been made in one type of fascia-lighting unit, which by the ingenious use of curved plate glass over the fascia lettering ensures that even illumination is provided from top to bottom of the fascia, this eliminating the inevitable drop in brightness that occurs on the lower section of such installations when ordinary systems of top lighting are employed.

Almost every variety of enclosed-lamp sign can be adapted for fascia-lighting work, the most important considerations being that the sign should have the minimum extension from the building surface, and should have a first-class daylight appearance. For enclosed-lamp fascia signs to have the necessary appeal it is recommended that at least one 40-watt lamp per letter should be employed.

Silhouette signs are also admirably suited to this class of work, presenting, as they do, such excellent daylight appearances, while the ready accessibility of the lamps provided in these signs undoubtedly appeals to the average retailer.

On the Continent, particularly in France, there is a tendency to develop fascia signs which show a strong modernistic trend, and these when correctly lighted are distinctly novel in appearance, as indicated by the illustrations in Figs. 12, 13 and 14.

Maintenance.—In every field of lighting maintenance is a subject of considerable importance, but in connection with electrical advertising devices it becomes a consideration of the first magnitude. In many cases the electric sign is the only representative of the advertiser which comes into direct contact with the public, and consequently it is desirable that it should convey the very best impression. No enterprising commercial house would send out living sales representatives in a dilapi-

FIG. 12.—Modern Treatment of Light Fascia.

dated condition, and consequently they should be equally strict in ensuring that their electrical sales representatives convey the impression of being well looked after, particularly as they appear before a much larger public.

Electric signs are subjected to conditions in exposed positions which are distinctly adverse from the point of view of cleanliness, and, in consequence, unless some regular system of maintenance is adopted, the devices rapidly lose their effectiveness.

The failure to replace burnt-out lamps can easily lead to ludicrous results which are far from serving the interests of the advertiser, while a dirty sign is an eyesore, however well designed and mounted.

FIG. 13.—Modern Shop Front showing Lighted Fascia.

Conclusion.—It is hoped that this paper will serve as a guide to some of the underlying principles of electrical advertising. It is fully appreciated by the author that reputable electrical advertising concerns are fully conversant with the practical requirements of sign design, and as they base their new designs on the excellent bedrock of years of experience they may have little to learn and something to criticize in a paper of this nature. On the other hand, there undoubtedly exist many electric signs which are very far from being satisfactory, and since these displays are obviously not the work of experts there may presumably be many to whom this brief survey will be of use.

Electrical advertising in this country has undoubtedly an enormous future before it, and it is of the utmost importance that when new displays are installed they should fulfil their functions in the most efficient manner possible, and, in particular, that they should be of such a standard quality that they do not prejudice authorities against their use. Otherwise the restrictions under which the sign expert is working will be tightened rather than loosened.

(*A full account of the discussion of Mr. Lingard's paper will appear in our next issue.*—ED.)

FIG. 14.—The Novel Use of Lighted Panels in Modern Shop.

The Need for Better Factory Lighting

The following communication, from Mr. Francis F. Middleton, who was present at the meeting in Birmingham on October 22nd, was unavoidably held over from our last issue: —

Mr. FRANCIS F. MIDDLETON (*communicated*): I feel I must thank Mr. Cooper for his very able paper, and the lucid manner in which he has marshalled a most interesting array of facts which must have entailed an enormous amount of time and labour. It is with some trepidation that I would like to refer to two salient points. The first is " the importance of good lighting." 80 per cent. of the executives interviewed consider it important, yet only 30 per cent., that is—10 per cent. very good, 6.6 per cent. good and 13.4 per cent. fairly good—have attempted to adopt it. For some unexplained reason the other 70 per cent. remain in the dark!

The second point is that it is our duty as illuminating engineers to enlighten them in more ways than one. We are all more or less conversant with the estimation of a weight, capacity, colour or length with a fair amount of accuracy, yet very few would be capable of making anything like so accurate an estimate of the intensity of a few varied artificial illuminations and I think there is a large market for a cheap form of photometer for factory work. It would not need to cover a large range of intensities nor be accurate to one-tenth of a foot-candle, but it should serve as a tool that every factory manager could use and should cost about the same as a very cheap camera.

I doubt if more than 5 per cent. of the industrial executives of this country have any idea of the maximum and minimum intensities that the money they spend on artificial lighting gives them. The installation engineer is failing in his job unless he can tell his customer the cost per square foot of area for a stated minimum foot-candle illumination on the working plane. The fittings manufacturers can supply him with the right type of fitting for the various situations, and no installation engineer ought to be without a photometer in his kit and, better still, be a member of this Society, and incidentally I think the arrangement of meetings in other centres than London a very good move to extend its influence.

Finally, I would like to add that, as a means of enlightening the users of artificial light, use might be made of the wireless broadcast. I certainly think it is of sufficient importance to the general public to warrant a few talks on the desirable features of good illumination.

Illuminating Engineering Society

(Founded in London, 1909)

TWENTIETH ANNIVERSARY DINNER

Wednesday, February 13th, 1929

The attention of members is invited to the DINNER which will be followed by Dancing and has been arranged to take place on WEDNESDAY, FEBRUARY 13th, 1928, to celebrate the Twentieth Anniversary of the Foundation of the Illuminating Engineering Society.

Mr. CLIFFORD C. PATERSON, O.B.E. (PRESIDENT) will preside, and a number of distinguished guests are expected to attend.

It is hoped that members will make a special effort to support the President and Council by their presence on this occasion, and bring with them, as guests, friends who are in sympathy with the aims and objects of the Society. Members may bring ladies as their guests.

The Dinner will be held at the TROCADERO RESTAURANT, Piccadilly, London, W., and the price of the tickets will be 15/- (exclusive of wine). The Dinner will commence at 7 for 7-30 p.m., and will terminate between 9—9-30 p.m., after which a hall will be available for Dancing.

Members are asked to let the Hon. Secretary know, as soon as possible, whether they will be able to attend, and the number of guests they expect to bring with them.

Applications should be addressed to the Hon. Sec., Mr. J. S. DOW, 32, Victoria Street, London, S.W.1, preferably not later than JANUARY 30th, 1929.

An Investigation of Electric Lighting in the Engineering Industry

Proceedings at the Special Meetings organized by the Illuminating Engineering Society in Birmingham, Manchester, Newcastle and Glasgow

(*Concluded from p.* 348, *December*, 1928.)

IN our last issue we gave an account of the proceedings at the special meetings organized by the Illuminating Engineering Society in Birmingham and Manchester. In what follows we deal similarly with the two final meetings of the series, held in Newcastle on October 31st and in Glasgow on November 1st, 1928.

Newcastle, October 31st

At the meeting in Newcastle, which took place on October 31st, the Hon. Sir CHARLES PARSONS, O.M., K.C.B., F.R.S., presided. Amongst those who assembled to meet Sir Charles Parsons at Tilley's Restaurant were Professor Thornton (Armstrong's College), Professor Gerald Stoney, Mr. W. T. Pinkney (Newcastle Electric Supply Co. Ltd.), and Mr. E. S. Evans (North-East Coast Lighting Service Bureau), from Newcastle; Lieut.-Col. C. H. Silvester Evans, Mr. J. Justus Eck, and Mr. J. S. Dow, from London; and Mr. J. L. H. Cooper.

After dinner at Tilley's the party proceeded to Dial House, the headquarters of the North-East Coast Lighting Service Bureau, where the meeting was timed to commence at 7-15 p.m.

The CHAIRMAN, in opening the proceedings at the meeting, said that in Newcastle most of them were closely concerned with electrical generating machinery, and with boilers and engines of all kinds. At this meeting they hoped to hear something of the manner in which factories and workshops containing such machinery should be lighted. Much technical experience and knowledge was certainly needed in order to secure the best results, and he hoped that they would have an interesting discussion on this point. The object of the Illuminating Engineering Society was to discuss illumination in all its aspects. It covered a field that was quite distinct from that dealt with by other bodies. He would now call upon Lieut.-Col. C. H. Silvester Evans to deliver a brief introductory address, dealing with the aims of the Society.

INTRODUCTORY ADDRESS BY LIEUT.-COL. C. H. SILVESTER EVANS, O.B.E., T.D., R.E.(T.), A.M.I.MECH.E., M.I.E.E.

In his introductory address Lieut.-Col. SILVESTER EVANS conveyed the regrets of the President (Mr. D. R. Wilson) and the President-elect (Mr. C. C. Paterson) at being unable to attend this gathering. He recalled that the Society had flourished for nearly 20 years, having been formed in February, 1909. The conception and foundation of the Society was due to Mr. Leon Gaster, whose death early in the present year had been such a great loss.

He quoted from the address delivered by Professor Sylvanus P. Thompson, the first President, at the inaugural meeting held on November 8th, 1909, when he said: "The Society has been founded to bring together all those who are interested in the problems, practical and theoretical, of the art of directing and adapting light to the use and convenience of man. . . ." The object of the Society was completely summed up in these words. Every source of light, natural and artificial, was embraced, and it could be realized how very wide was the field of the Society, which was of interest alike to the industrialist, physiologist, architect and physicist, and especially the "amateur user," e.g., the office worker and the housewife.

Lieut-Col. Silvester Evans explained that these varied interests were represented on the Council of the Society. By the aid of its foreign correspondents the Society was able to keep its members informed of the activities of other nations; but until this year the knowledge and experience of those nearer home had not been fully available, nor had members in London been able to meet those in the great provincial centres and exchange views on illumination. He regarded it as a privilege to address this meeting in Newcastle, and he hoped that some of those present would join, so that the Society could learn of their experience and their special problems, and the interests of all concerned in the art of illumination might thereby be advanced.

DISCUSSION OF MR. COOPER'S PAPER.

The CHAIRMAN said that they were much indebted to Mr. Cooper for his masterly survey of the present position in regard to industrial lighting. As a matter of history, he might mention that the very first installation of incandescent electric lamps on a large scale took place in Newcastle on the occasion of the exhibition held 42 years ago. Carbon-filament lamps, made by Messrs. Clark, Chapman & Co., were used, and an effort was made to secure high efficiency by the sacrifice of lamp life, the efficiency being of the order of one watt per candle, but the life only about 100 hours. This was, he believed, the first large installation of incandescent lamps in the world.

Mr. J. L. H. COOPER then read his paper entitled "An Investigation of Electric Lighting in the Engineering Industry."*

Professor W. M. THORNTON (Armstrong College), who opened the discussion, remarked that some of the actual lamps mentioned by Sir Charles Parsons were still on view in his laboratory at Armstrong College. Mr. Cooper's paper contained a valuable account of the condition of lighting in the engineering industry. Some of the figures, indeed, were almost startling, and one received the general impression that much remained to be done to improve the conditions. There could, he thought, be no doubt that appropriate lighting meant better output and less fatigue. In one case within his knowledge, in which the output could be measured in bulk, an increase in production of 14 per cent. was recorded when floodlighting was installed. As one who had spent many years in engineering works, he knew how bad the conditions might be in winter—slowing down the work and leading to accidents. Good lighting was an important contribution to the mental efficiency of workers. Physical efficiency was a factor which was less and less in demand as industry became more intricate and detailed. Fatigue was now more a question of nerves than of muscle alone. The old adage, "By hammer and hand all arts do stand," was no longer true, if it ever was true. It was by judgment and brain that progress, even in mass production, was made, and, as an aid to correct judgment, hand and eye acting together, good lighting was of great importance.

High intensity of illumination alone was not good lighting. It was essential that there should be no high lights and few strong shadows; but, instead, a sense of diffused light resembling daylight. Everyone now recognized that the filaments of gasfilled lamps should not be visible. The physiological sense of light was a function of the area of the pupil aperture. Light falling on one eye caused contraction of both pupils. This contraction was designed to prevent overexposure and fatigue of the retina, and there were probably no nerves more easily fatigued by overstimulation than those controlling the eye. On the other hand, the smaller the pupil the better the definition.

All parts of the retina were colour-blind in very dim light, a factor which did not seem to have received much consideration as bearing on the inspection of roofs and sides in connection with the lighting of coal mines. The

* *The Illuminating Engineer*, January, 1928, pp. 5–15.

colour of an object was caused by the waves which it could not absorb, and therefore reflected, and this had an important bearing on the screens adopted for various industrial processes. In all work except that in which the materials used were red in tint a bluish light gave the best definition, and, as the blue element is so much stronger in daylight than red, one thus approximated to daylight conditions. Lamps furnished with a translucent screen of blue tint were now coming into use in offices. They had been found to contribute to efficiency and correct judgment in work where accurate vision was necessary, especially, perhaps, in working with iron or in shops where there was much difference in detail.

One further point might be mentioned: the glare arising through light directly reflected from bright points or surfaces. If the eye saw a single bright point, directly or reflected, this meant eventual fatigue, and such reflected glare could not be obviated by using a clear gasfilled lamp with a deep metal shade. One could see more in a room illuminated by good indirect lighting than when illumination was provided by an intense lamp causing bright reflections. The compromise in large engineering processes, where indirect lighting was more difficult was, he thought, in the combined use of anti-dazzle colour screens with high-power lamps.

Good lighting, Professor Thornton concluded, was not only important because of its influence on output: it was also essential as an element in welfare. Nystagmus, that singular nervous eye disease of miners, was now thought by many to be caused largely by deficient illumination, not distinctly physiological, but possibly what was termed a neurose—a species of apprehension. The unconscious movement of the eye, looking right and left for better definition, led to the formation of a habit which only good illumination could break. There was fortunately no case in works engineering where such a combination of bad illumination and nervousness was likely to occur, but we might learn from it that the absence of proper lighting led to a state of the eye which, though it might never become a disease, did impair the visual efficiency and therefore the welfare of the worker.

Mr. JUSTUS ECK said that the meeting was to be congratulated on hearing such an interesting paper. Mr. Cooper had necessarily had to condense his subject, but he believed that everyone in the room was provided with a copy of the journal in which the complete paper had appeared. The paper had first been read in London, and subsequently in Birmingham and Manchester. Following a geographical order, they came next to Newcastle, and, on the following day, the paper was to be read in Glasgow. Each of these cities possessed special local industries, and this fact was reflected in the discussions. He hoped that local problems would be raised, as it was the aim of the Society to gather information which would be of interest all over the world.

Mr. Cooper had mentioned $2\frac{3}{4}$ hours as the average number of hours during which lighting was required per day. From his experience in the cities named he thought that the average must often be higher than this. In conclusion, Mr. Eck emphasized the importance of the subject alike from the standpoint of efficiency and welfare. It was quite likely that in many industries a gain in production of 15 per cent. might be realized by better lighting; but it was equally important that, as a result of better illumination, workers could carry through their day's work without unnecessary fatigue.

Mr. W. T. PINKNEY (Newcastle Electric Supply Co. Ltd.) congratulated Mr. Cooper on his paper. At the present time industry had to look for every possible prospect of improvement, and, as Mr. Cooper's figures had shown, better lighting formed one of the most important helps to higher efficiency. Mr. Cooper had emphasized the general improvement in production arising from better lighting. He (Mr. Pinkney) would like to know the exact shape of the curve connecting the two factors. At what stage did it flatten out, as one assumed there must be some finality? He noticed that in a recently issued report of a committee concerned with absenteeism in mines bad illumination, on the coal face or underground, was mentioned as one of the most important indirect causes. He would like to know if Mr. Cooper could furnish any information on this point, as it was obviously a very important one in the Newcastle area.

In conclusion, Mr. Pinkney supported the invitation given by Lieut.-Col. Silvester Evans to those present to join the Society; it was quite worth while to join, irrespective of attendance at meetings, in view of the journal which members received.

Professor GERALD STONEY alluded to his experiences at Manchester University and problems involved in the lighting of lecture theatres. He had found it very important that lamps should be screened from the eyes of students, so that they did not have to look through the lights at the lecturer and the blackboard. In dealing with the lighting of workshops one of the chief difficulties had been to ensure that the light penetrated into every corner. In erection work permanent lighting with fixed local units was found to be impracticable. They had to use portable inspection lamps, and he believed that the design of such units was substantially the same as it was 40 years ago. Now one had a better holder, and a gasfilled lamp instead of a carbon one; otherwise there was little difference. If anyone could design a really efficient portable lamp this would be a great blessing. For a portable lamp quite a low candle-power was needed. A general difficulty was the frequent breakage of lamps, frequently resulting in short circuits and the blowing of fuses. What was needed was a well-shaded lamp of, say, 16 candle-power, operating on 240 volts, with an obscured bulb, and one that could be dropped on the floor without breaking.

Mr. CROSS expressed his interest in the paper. He agreed that industrial lighting was of the greatest importance, especially from the psychological standpoint.

Mr. J. ROSEN referred to the change in the standard of illumination in workshops. From a report made about ten years ago he found a general average in the works of about 3 foot-candles. The present value was, he supposed, about 6 foot-candles, but he gathered that the author recommended up to 10 foot-candles. A good feature was that lighting was generally now more diffused than in the past. He had also noted the good results attending the whitewashing of walls and surroundings. In one case the better illumination resulting had led to the discovery that many of the machine tools were out of date; the whole shop was altered and much improved results obtained.

Mr. M. C. TONER remarked that cases sometimes were met where, after a good lighting installation had been put in, the workers complained that they could not see. He recalled an instance where the illumination had been doubled, and still workers grumbled. He believed that this was due to the fact that the workers, especially in the textile industry, were used to a local lamp, and could not readily adapt themselves to the new conditions. He thought that there was a great future for artificial daylight, especially in the textile mills and printing works, and other places where colour matching was important.

The CHAIRMAN said that they had had an interesting discussion on an interesting subject. These were days of transition. There had first been a sequence of lamps —carbon-filament, metal-filament and gasfilled; subsequently new methods of using the lamps had been introduced and manufacturers had become conscious of the need for expert advice on the lighting of their workshops. He thought that the most common error was to overlook the fact that the all-important question was the light reflected from the objects illuminated. It was not necessary to see the source, but only the things it served to reveal—just as one saw the moon by the light falling upon it from the concealed sun. Those interested might reflect that one could no longer see the moon when the sun was in the sky!

He was sure that all those present would join him in thanking Lieut.-Col. Silvester Evans for his address and Mr. Cooper for his excellent paper, and he would now call on Mr. Cooper to reply to the discussion.

Mr. J. L. H. COOPER recalled that Sir Charles had mentioned some early lamps furnished by Messrs. Clark, Chapman & Co. He (Mr. Cooper) had served his time with that firm, but he was not familiar with the lamp. He was afraid that in those days one did not observe closely what kind of lighting one had. He was interested in the instance mentioned by Professor Thornton of an improvement in output of 14 per cent. as the result of better lighting. That was one more corroboration of the relation between illumination and efficiency of work. Mr. Pinkney had asked for detailed figures on this point. He (Mr. Cooper) might refer him to the tests conducted by the Illumination Research Committee with illuminations ranging from 2 to 20 foot-candles; apparently with the latter illumination the ultimate output attainable with full daylight illumination was considered to be attained; indeed he thought that the output was slightly increased. In judging the economical effect of higher illuminations each case of factory lighting must be considered on its merits; if, for example, it were shown that it was economical to go up to 30 foot-candles in a drawing office, then even this figure might be justified. He had not with him at that moment any data bearing on the lighting of mines, but he understood that this question was now being studied by a special committee. Professor Stoney had referred to the design of portable lamps. In the large erecting shops which he (Mr. Cooper) had visited he had found many floor standards in use, notwithstanding the liability of these standards to be knocked over. He would pass on to the lamp manufacturers the problem of producing an unbreakable lamp, but he thought Professor Stoney would find that there were quite a number of portable units suitable for use in erecting shops now available.

He would suggest that for ordinary machine shops 10 foot-candles would be the recommended value, but where we were considering 10 to 20 foot-candles, 25 to 30 foot-candles were being used in factories across the water. He agreed that difficulty was sometimes experienced in reconciling workers to new and improved methods of lighting. He recalled the case of an old worker whom he had interviewed. It was difficult to say whether he was really pleased with the new lighting or no, but he produced a bit of candle from his pocket and explained: "When I want to do any fine work I always use this bit of candle." That experience showed the need for education. He might mention that he had found that the running cost of modern illumination as a percentage of the wages bill did not exceed 0.86 per cent. He thought that this would be considered a very low figure, showing that expenditure on good lighting was not a relatively small item, and well worth the advantages secured.

In conclusion, Mr. JUSTUS ECK proposed a very hearty vote of thanks to Sir Charles Parsons for presiding at the meeting. He felt sure they were all conscious of the honour which Sir Charles had done them by taking the chair, and it was unnecessary for him to recall that Sir Charles was the inventor of the turbine, which now drove so many generators that supplied electric light and thus, ultimately, the illumination which they had been discussing that evening.

The CHAIRMAN, in briefly responding, referred to his own close friendship with Sir Joseph Swan, the inventor of the electric lamp, whose pioneer work had rendered modern methods of illumination possible. It was a coincidence that this meeting had been held on a day which was the hundredth anniversary of the birth of that great inventor.

Glasgow, November 1st

This meeting, like the preceding ones, was generally considered a most successful one. Amongst those who assembled at White's Restaurant were Mr. J. S. Dow and Mr. J. Eck, from London, and Mr. J. L. H. Cooper. To everybody's regret Mr. S. B. Langlands was unable to attend owing to indisposition, but the party was joined by Mr. Sims, Mr. McAllister, Mr. H. E. Hughes and others from Glasgow, and by Dr. James Kerr, an old and valued member of the Illuminating Engineering Society, who came over specially from Edinburgh for the occasion.

At the subsequent meeting, which was held in the Central Halls, there was an excellent attendance, estimated at between 120 and 150. Professor Magnus Maclean, DSc., LI.D., F.R.S.E., presided, and the introductory address was given by Mr. J. S. Dow.

INTRODUCTORY ADDRESS BY MR. J. S. DOW.

Mr. DOW briefly explained the circumstances which had prevented the President of the Society from attending this meeting. He recalled the formation of the Society by the late Mr. L. Gaster nearly 20 years ago, and pointed out the variety of subjects discussed at its meetings, and the unique opportunities it afforded for co-operation between experts on lighting and users of light.

The subject about to be introduced by Mr. Cooper—the problem of factory lighting—aptly illustrated the importance of actual users taking an interest in illumination. Much could be learned from those who had a lifelong knowledge of certain industries and who, whilst perhaps not fully aware of the latest advances in illuminating engineering, understood completely the requirements of the processes to be lighted.

Mr. Dow explained that this meeting in Glasgow was the final one in a series of gatherings arranged for the first time in leading provincial cities. They had been interested in hearing of the special lighting problems associated with the industries of Birmingham, Manchester and Newcastle. He hoped that some of the speakers would touch upon aspects of lighting of special interest to Glasgow.

This meeting was intended to afford an opportunity of discussing this vital problem of industrial lighting, but he hoped it would serve another purpose in interesting those present in the work of the Illuminating Engineering Society, that some of them would become members and share in the good work which the Society was trying to do. Hitherto the Society, like many others, had held meetings exclusively in London; but they were conscious that London was not the British Isles, and they were anxious to be kept in touch with developments in leading provincial cities. In conclusion, Mr. Dow expressed the pleasure it gave him to address an audience in Glasgow. This was the first meeting that the Society had arranged in that great city, but he hoped that it would not be the last and that they would have other opportunities of exchanging views in the future.

DISCUSSION OF MR. COOPER'S PAPER.

Mr. J. ECK, who opened the discussion on Mr. Cooper's paper, drew attention to the fact, revealed by the statistical data, that the great majority of manufacturers approached emphasized the importance of good illumination; yet the percentage of shops that were really well lighted was remarkably low. Users should appreciate that it was not enough merely to purchase modern fittings; these fittings must be installed in the correct positions. Mr. Eck mentioned instances in shipbuilding yards and rolling mills which he had just visited of good types of reflectors equipped with bare lamps which projected and gave rise to glare. Further, even when a perfectly designed installation was installed, it was necessary for lamps and fittings to be kept clean; otherwise consumers would soon find that they were reaping little benefit from their expenditure. As Mr. Cooper had pointed out, the cost of good lighting was only a fraction of the total cost of produc-

tion. He (Mr. Eck) agreed that an increase in the " degree of illumination " was often very beneficial, but it was equally important that the *quality* of illumination should be satisfactory, and that glare and troublesome shadows should be eliminated. In walking through the streets of Glasgow that evening he had seen some excellent lighting, but also instances of exposed bright lamps in shop windows which had a most dazzling effect. Appearance of colours by artificial lighting was also frequently of importance. There were to-day many forms of daylight lamps available. He would not say that all the claims made for them should be taken literally, but this aspect of lighting obviously deserved attention. In conclusion, Mr. Eck supported Mr. Dow's invitation to those present to join the Illuminating Engineering Society, or at least to take in the *Journal* of the Society, so as to be kept informed of what was taking place in the lighting field.

Dr. JAMES KERR remarked that the artificial lighting of factories was of special interest to Glasgow, where, he thought, the average of 2¾ hours of artificial lighting per day would be somewhat exceeded. The great gain in output and efficiency to be secured by better lighting was not even yet sufficiently understood; he (Dr. Kerr) had learned to appreciate this by some experiences in Germany many years before the war. In deciding what constituted good lighting the experience of the human eye was the final test. The great secret of proper lighting was correct distribution of light and avoidance of excessive contrasts. He personally had found a local " daylight " lamp of considerable benefit when engaged in continuous writing, and since its installation he had had no subsequent trouble in the form of headaches, etc. Daylight, however, differed from artificial light, not only in colour but in the manner of distribution, and in designing artificial lighting installations this should be kept in mind. He believed that the information disseminated and the education in lighting matters furnished by the Illuminating Engineering Society would be of untold benefit in the future.

Professor G. W. O. HOWE expressed his pleasure in being present at this meeting. Mr. Dow and he had been colleagues in London in 1909, when he was a member of the Illuminating Engineering Society for a short time. He considered that the dominant consideration in providing good lighting was elimination of glare. (Professor Howe alluded to the lighting of the lecture theatre as setting a bad example in this respect!) If the use of obscured lamps instead of clear ones became general practice this would be of great benefit. The use of lamps unsuitable for the reflectors containing them was also a fruitful cause of glare. He was afraid that those engaged in engineering works often knew little about lighting, and there was a great field for educational work in the engineering industry. He wished that engineers on the Clyde could be given frequent demonstrations of the difference between good and bad methods of lighting, such as those familiar in London. He noticed that Mr. Cooper had used the term " degree of illumination." He suggested that whilst everyone, even those in foreign countries, knew what was meant by " foot-candle," the term " degree of illumination " meant nothing, and, if used at all, it should be applied to some standard which was adaptable to every country.

Mr. H. E. HUGHES agreed with Professor Howe that the lighting of the lecture theatre was open to criticism. He confessed that, in common with Mr. Cooper, he had been in the habit of using the term " degree of illumination." He thought that, in approaching the layman, there was some justification for the term, which was familiar with the conception of " degrees of temperature," though the temperature scale used in different countries was not the same.

It was sometimes difficult to induce owners of factories to make adequate provision for illumination. He had yesterday visited a factory where there was a room 350 feet long and nearly 300 feet wide. This room received, on the average, about 20 foot-candles of daylight illumination; yet the owners had installed a 20-kw. transformer to furnish the artificial illumination. With this expenditure of energy the artificial illumination would not exceed about 1 foot-candle. Now it had been decided to introduce a 50-kw. transformer, but even so the artificial lighting would not be very generous. He felt sure that ultimately more light would be found to be necessary. He mentioned this case to illustrate the need for education, a process which was often only gradual.

Mr. J. D. MACKENZIE said that this was a most interesting meeting to him, because, when in London, he had been one of the founder members of the Illuminating Engineering Society, and he had contributed to early issues of its journal. At that time he was already an enthusiast for scientific illumination but he feared he was regarded by most of his friends as " having a bee in his bonnet," the usual reward of pioneers. Reference had been made to the need for educational effort. He recalled being asked to arrange the lighting of a chemist's shop, about 1889. He had installed lamps in nickel-plated reflectors which were hidden from view, and the client was at first quite pleased. But subsequently he received a message from this client who asked him to make the lamps visible—for about half his time was occupied in replying to people who asked where the light came from!

The Illuminating Engineering Society had done an enormous amount of good during the past 20 years and he wished it continued success. But there was still a very great field to plough and harrow. He hoped it was a sign of grace that they were arranging " provincial " meetings. He always challenged that word—for Scotland was not a province of London, or of any other place, though it was true that London happened to be the seat of Government. He had no doubt that if the Society would establish local centres, as the Institution of Electrical Engineers had done, they, in Glasgow, would be glad to assist London in the common task of educating people in the principles of good illumination.

Professor PARKER SMITH said that his own interest in lighting had been first kindled by a request from Mr. Langlands that the rooms of the College might be used for some meetings concerned with illumination. He had at once called the lighting engineer and had said " We must look after our own lighting first," and he believed that the whole of the Royal Technical College was now equipped with modern lighting units. The large lecture room, laboratories and drawing offices all presented special problems, and much experimenting had been done. He had obtained a considerable amount of help from Mr. Hughes and the Lighting Service Bureau, and he had subsequently arranged for some of his students to attend there and witness demonstrations of lighting.

This had since been made a regular feature of their course.

In regard to the subject under discussion he wished to emphasize the importance of electricity being available at a cheap rate. He had heard that day that the Clyde Valley Electrical Power Company had reduced their two-part tariff to ½d. a unit. He thought this was one of the most encouraging things he had heard for some time, and he felt sure that when the change took effect in January it would act as a strong inducement to people to adopt abundant lighting.

Mr. ATTWELL asked if any table of intensities of illumination for different types of work were available, and what the definition of maximum intensity should be. The height at which lighting units were mounted was of considerable importance. Provided the correct types of units could be used he believed that the higher they were placed the better the distribution of illumination secured. As regards the reference to degrees of illumination possibly the difficulty would disappear if values were expressed in lumens.

Mr. J. L. H. COOPER, replying to the discussion, expressed his appreciation of the kind reception of his paper. He agreed with Mr. Eck regarding the importance of *quality* besides intensity of illumination, and also with Dr. Kerr's remarks on the need for good distribution of light. From figures he had seen he believed that the cost of good lighting in many cases would be less than one per cent. of the total cost of production. In regard to Professor Howe's advocacy of sprayed

lamps he agreed that they were often useful, but there were still many cases in which clear bulb lamps might be legitimately used, provided the light was efficiently controlled. Education in proper methods of lighting could only be effected by means of demonstrations, which should be given before not only managers and engineers but also foremen and charge-hands in factories. The model factory being equipped in the Midland area was an example of how such demonstrations might be staged. In his own conversations with works managers and others who were not familiar with technical terms he had found that "degree of illumination" seemed to be readily grasped though the phrase might be open to objection from the scientific standpoint. Mr. Attwell would find that tables of intensities were furnished by the Lighting Service Bureau, and were being widely followed by lighting engineers. Similarly particulars of mounting heights and spacing ratios would be found in the catalogues of leading manufacturers of lighting fittings; naturally such data depended on the particular unit employed. The term foot-candle was not very widely understood and he thought it inexpedient, at the present stage, to attempt to translate values in terms of lumens.

Mr. MCALLISTER proposed a vote of thanks to Mr. Cooper for his excellent paper. He understood that Mr. Cooper was about to undertake a similar survey in other fields of lighting and he hoped that they would have an opportunity of hearing the results of this also in due course. (Applause.)

In conclusion Mr. J. ECK proposed a very cordial vote of thanks to Professor Magnus Maclean for presiding at the meeting. London was perhaps apt to regard itself as the capital of the world, but all electrical engineers bowed down to Glasgow as the home of the greatest of all electrical engineers, Lord Kelvin. Lord Kelvin had had many eminent followers. Amongst them was Professor Magnus Maclean, whose name was known not only to people in Glasgow but to hundreds of others who had been his students, and to many others who were familiar with the books and papers published under his name. They all felt that they had been honoured by his presence and by the encouraging send-off which he had given to the movement in Glasgow. He hoped that, as Mr. Mackenzie had suggested, a branch of the Society might ultimately be established in Glasgow. But however this might be there could be no more pleasant duty than coming up to Glasgow to participate in such an interesting and delightful evening.

A Discussion on Illuminating Engineering in Dublin

FOLLOWING the meetings of the Illuminating Engineering Society held in Birmingham, Manchester, Newcastle and Glasgow, there was another interesting departure—the discussion on "Modern Illuminating Engineering," opened by Mr. Justus Eck, well known to readers as a member of the Council of the Illuminating Engineering Society, on November 7th. This meeting was arranged with the co-operation of the Engineering and Scientific Association of Ireland, and was held at the National University, Dublin. There was an attendance of over 100.

The proceedings were opened by Professor William Tatlow, of Trinity College, Dublin, who emphasized the great boon which modern illuminants were to all intelligent users, and the necessity of careful study of all methods of securing efficiency and reliability.

Mr. Justus Eck, in the opening remarks of his address, alluded to the valuable paper on "artificial illumination" recently contributed by the Chairman to the local branch of the Institution of Electrical Engineers. Mr. Eck then proceeded to give a general sketch of the aims and objects of the Illuminating Engineering Society, founded by the late Mr. Leon Gaster in 1909. That Mr. Gaster was a pioneer and a seer was shown by the subsequent development of the movement. He recalled that the example of England in forming an Illuminating Engineering Society had been followed by Germany (1911), Japan (1917), Austria (1924), and Holland (1926); all these bodies were in a flourishing condition, and he now heard that Russia was also taking a part. The United States of America was the earliest in the field. The vast developments in that country had been strikingly illustrated at the International Illumination Congress, from which the President of the Illuminating Engineering Society in London, Mr. C. C. Paterson, had just returned.

Mr. Eck explained that hitherto the work of the Society had been conducted mainly London, but a new departure this year had been the holding of special meetings in various provincial cities. The possibility of granting a lower rate of subscription to members residing at a distance from London was now under consideration. It was no doubt premature to suggest the formation of a branch of the Illuminating Engineering Society in the Irish Free State, but he hoped that this discussion would raise sufficient interest to encourage the holding of occasional meetings to deal with specific problems in illumination. Possibly some of those present might like to become members of the Society; but, in any case, he recommended them to keep themselves abreast of the latest developments by studying its journal (*The Illuminating Engineer*).

In the latter part of his address Mr. Eck touched on the many varied problems with which the illuminating engineer of to-day had to deal, illustrating his remarks by numerous lantern slides. Lighting experts were concerned with both night and day requirements and with every class of structure, alike for the railways, public highways, the air and the open sea; not only with conditions at ground level but with lighting underground, in mines. Mr. Eck described how illumination photometers had been devised to enable illumination to be measured and standardized, and how efforts were constantly being made, by the design of suitable glassware and reflectors, to meet the needs of the human eye. The need for co-operation of the architect was emphasized, and lantern slides were shown illustrating typical modern installations in shops, factories and other types of buildings. The cost of installation and maintenance was illustrated by diagrams, the lecturer pointing out that expenditure on lighting formed but a small fraction of the total costs of equipment and production, and was amply justified by the benefits secured.

Over 50 well-selected lantern slides were shown, and served to give the audience a good general insight into modern lighting problems.

Mr. TWEEDY, continuing the discussion, urged that Dublin should set a good example to other cities in matters of illumination, especially in view of the extensive developments in electrical supply throughout the Irish Free State. Mr. CUMMINS emphasized the relatively low cost of good lighting, and urged the need for education in correct principles of lighting. Mr. ALLAN suggested that more might have been said on the subject of street lighting. Mr. BRUTY remarked that users should not be satisfied with selecting fittings of good glass, but should know how to apply them. He pointed out, for example, that the mere fact of adopting reflectors complying with the standard B.E.S.A. requirements did not absolve users from care in deciding the spacing and location of such units. For this purpose knowledge and skill were needed. Mr. HANDCOCK welcomed the scientific study of illumination, but remarked that decorative aspects also needed study, especially in connection with shop lighting. There was a tendency for this phase of the subject to fall into the hands of the decorator.

After others had joined in the discussion, Mr. JUSTUS ECK briefly replied, explaining that it was impossible to cover the full scope of illuminating engineering; street lighting alone would require more than a complete evening's discussion. He emphasized the need for trained illuminating engineers who would co-operate with makers of lighting fittings and decorators in order to ensure these appliances being judiciously used. In conclusion, he thanked the Association for the opportunity they had afforded him of bringing this subject forward, and trusted that the seed thus planted would flourish.

POPULAR & TRADE SECTION

COMPRISING

Installation Topics—Hygiene and Safety—Data for Contractors—Hints to Consumers

(The matter in this section does not form part of the official Transactions of the Illuminating Engineering Society; and is based on outside contributions.)

Scottish Electric Lighting Service Bureau

THIRD ANNUAL REPORT.

The third annual report of the Scottish Electric Lighting Service Bureau, received last month, shows that progress has been well maintained during the past year. During the past year all except four of the total of 57 lectures fell within the eight months which constitute the "lighting season." More than half of these lectures were delivered elsewhere than at the Bureau. During the year 868 persons attended lectures at the Bureau and 1,452 lectures elsewhere, and 332 called for advice. The average attendance at the Illumination Design Course was 43.

The visit of students of the Royal Technical College to the Bureau for two lectures on illuminating principles and design has now been made a regular annual feature. Lectures have been given in 12 towns and cities other than Glasgow, and an active share has been taken in the "C.E.D.A.C." campaign. Approximately 11,800 copies of a brochure, illustrating the work of the Bureau, have been distributed. Special publicity has been given to articles dealing with show-window lighting in Scottish trade papers, and the district engineer has prepared an illumination bulletin on sports lighting, which has been submitted to the London Bureau.

For the year now entered upon a considerable number of lectures have already been arranged. Included amongst these are a number in connection with the Factory and Workshop Lighting Campaign. Another Illumination Design Course, consisting of weekly lectures delivered mainly by lecturers from the London Lighting Service Bureau, is now being conducted.

Women Engineers and Factory Legislation

A somewhat singular point is raised in some recent correspondence which has passed between the Council of the Women's Engineering Society and the Home Secretary. It appears that the activities of women engineers are seriously hampered by certain clauses in the existing Factory Act which forbid women to work in a power station after 8 p.m. and on Sundays. The regulation, in so far as it refers to women workers in factories as a whole, was doubtless a beneficial one; but its rigid application would obviously make it very difficult for women to share in many forms of engineering, and especially electrical work, as they desire. It is understood that the Home Office is considering the revision of these particular regulations, and we hope that a way out may be found.

"Industrial Lighting" A Useful Benjamin Production

We have just received from Messrs. Benjamin Electric Ltd. a copy of their booklet entitled "Industrial Lighting," which contains 150 pages of useful matter assembled in pocket form. The compilation of this booklet must have involved a considerable amount of work. It is an enterprising departure.

A Model Industrial Lighting Exhibit in Birmingham

On the occasion of the recent meeting arranged by the Illuminating Engineering Society in Birmingham the writer was afforded an opportunity of inspecting the new model industrial lighting exhibit which is being arranged by Mr. Anderson adjacent to the premises of the Electricity Supply Department in Dale End.

FIG. 1.—The Entrance to the Modern Factory Lighting Exhibit, in Dale End, Birmingham.

Attention to the exhibit is drawn by means of the illuminated sign outside the building (see Fig. 1). Fig. 2 shows a section of the exhibit in course of equipment. This room will be laid out to resemble a typical factory, and good and bad methods of lighting can be contrasted. Similar alternative lighting systems are provided in an adjacent drawing office.

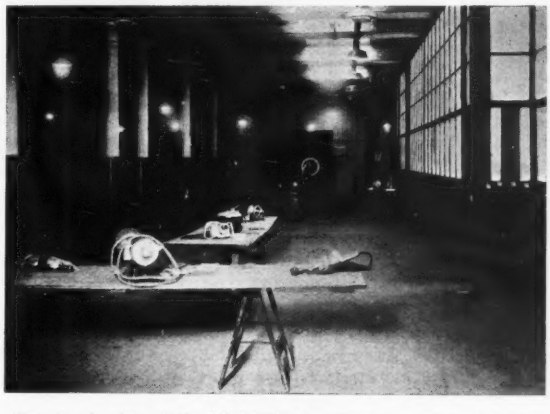


FIG. 2.—A view of the Model Factory in course of equipment, provided with alternative modern and obsolete methods of lighting.

Modern Lighting Designs for Interiors

AN interesting paper was read by Mr. H. T. Young on the above subject at the second E.D.A. Conference on November 15th. Mr. J. W. A. Beauchamp, late Director of the E.D.A., presided. The paper was illustrated by demonstrations of a variety of novel lighting fittings, the chief feature of which is the important part played by translucent glass of various kinds—cut, moulded, etched, sandblasted and coloured. Such glass can be incorporated in ceilings, cornices, friezes, panels, architraves, etc. Fittings of this type may be sunk in the walls and ceiling, but they may also be mounted thereon. Thus the new designs are not intended exclusively for new houses, but can be used in existing buildings—though naturally the fullest application of the new methods is possible when they can be combined with the architectural design.

Mr. Young explained that the first inspiration came from Mr. Beauchamp and Mr. Bush after their visit to the Decorative Arts Exhibition in Paris in 1925. We have now entered upon an era of modern creative design in architectural decoration, furnishing and lighting. If variations in style and design are necessary in architecture, decoration and furnishing, how much more in lighting! No one can imagine the part that will be played in our lives by light in, say, another ten years. The homes of people may be beautified and transformed by light to an extent beyond our dreams. Electric light, first put to commercial use in the early 'eighties, came after gas, and gas came after candles and oil. Hence there is a tendency to imitate traditional designs —to forget that it was no longer necessary to provide the flow of oil or gas, and for the supply means of combustion. Mr. Young said that he could appreciate the inspired creative design of some English, French and Dutch chandeliers—but let it not be forgotten that they were designed for use with *candles*, each yielding approximately one candle-power and not for modern sources yielding 20, 30 or even 60 candle-power.

At the present time one saw almost everywhere the same type of bowl fittings enclosing a high-power gas-filled lamp. Fittings had become stereotyped to house these lamps, and the possibility of subdivision of light into smaller units had been neglected. Illuminating engineers had been preaching the gospel of efficiency, but the artistic possibilities of light had been overlooked. Now the industry was faced by a demand for something more interesting and beautiful. Supply authorities were encouraging consumers to use more light; but what the industry needed is more creative designers. Where were they to be found? Mr. Young suggested it was mainly from the architectural schools that the necessary skill and outlook might be derived.

In conclusion Mr. Young quoted a paragraph from Sir William Bragg's recent presidential address to the British Association:—"Just as any particular case of mass production can be regarded as a temporary condition which the growth of knowledge brings and in the end supersedes, so also may be said of any law or convention or definition that knowledge is both the parent and destroyer. Time devours his own children."

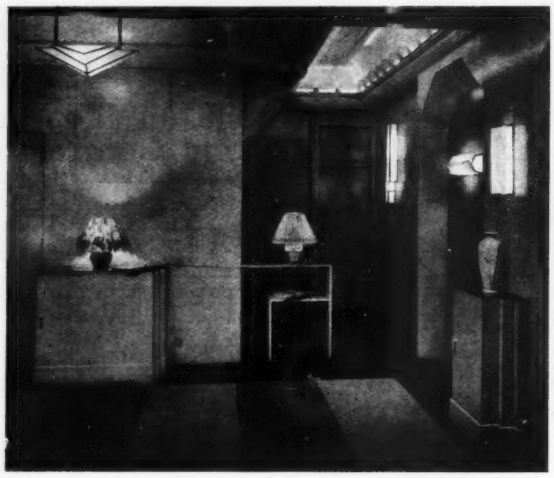


FIG. 1.—A Corner in Mr. Young's Showroom, showing cornice lighting in background and various novel designs.

He himself had given practical proof of his acceptance of this statement by scrapping all the decorations and practically all the fittings in his own firm's showrooms, and they had spent a sum of money on designing new fittings and a new setting for them. They had also obtained the services of the finest designer available. The showrooms were not completed, but the mere display of a few modern fittings in the window for the first seven days brought more in enquiries than they had received in the previous seven months. (By the courtesy of Mr. Young we were recently afforded an opportunity of inspecting these interesting new showrooms. The above illustrations are examples of only a few out of many novel devices, based mainly on the use of decorative glass and each with some distinctive design and colouring. The cornice lighting seen in the background of Fig. 1, embellished with a fringe of tinted-glass moulding and yielding soft rose-coloured light, was particularly happy, and the same applied to various special corner lights, panels and artificial ceiling units.)

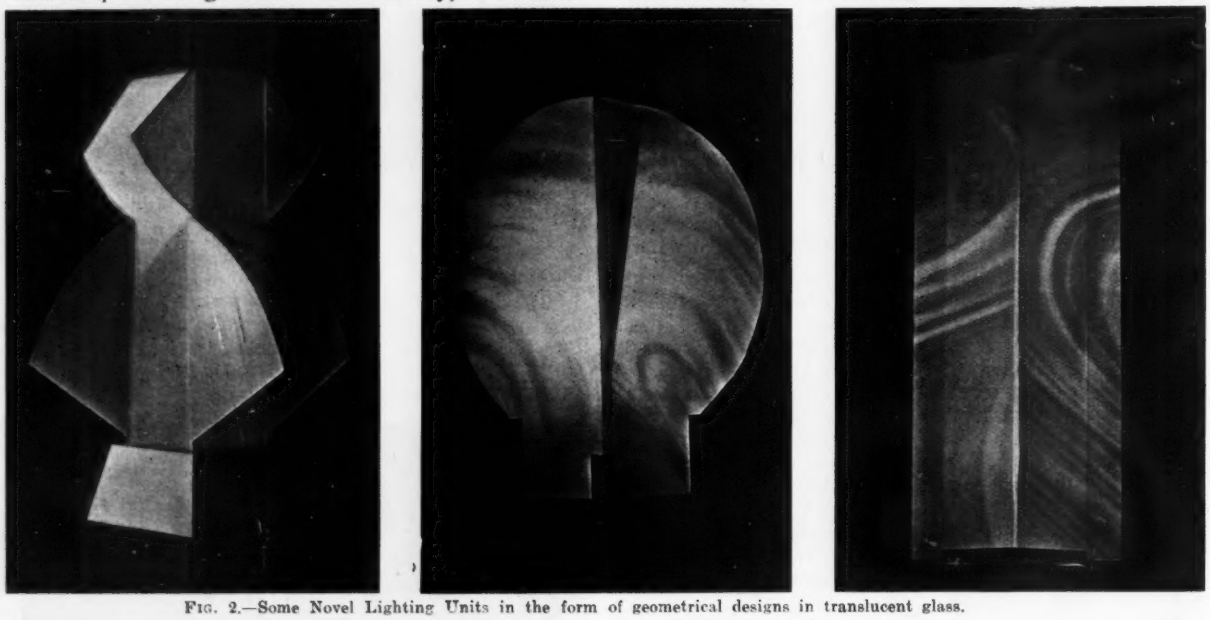


FIG. 2.—Some Novel Lighting Units in the form of geometrical designs in translucent glass.

Lighthouses: Their Application to Traffic, by Road, Sea and Air

THE popular conception of a "lighthouse" is a beacon erected on the sea-coast to safeguard vessels at sea. But, in fact, during recent years lighthouses have become equally important in two other fields: in aiding traffic on the road and in the air. In each case the lighthouse has somewhat different functions to fulfil, and its design must be modified accordingly. The beam of the road lighthouse need naturally only be visible to people on the road, so that its "sweep" is a narrow one. The beam from a coast lighthouse must be visible over a much greater area; yet it will be noted that it is only in one horizontal plane, at sea level, that its light requires to be seen, and that even so the angle covered by a coast lighthouse is frequently no more than 180°, as the rays need not pass inland. The aerial beacon or lighthouse serving to indicate the whereabouts of an aerodrome is in some respects a more difficult problem, as it is expedient that the light should be visible upwards over a wide angle, as the aerodrome may be approached from many different directions.

It is only within recent years that the road lighthouse has come into being. In Fig. 1 we reproduce, by the courtesy of the Gas Accumulator Co. Ltd., a typical view of this now familiar object, utilizing a red winking light mounted on a substantial base. Such "lighthouses" are becoming quite usual at important junctions of arterial roads. According to Mr. John Prioleau, the well-known writer on motoring subjects, they probably constitute one of the most effective traffic safeguards yet devised. Other helpful dodges, such as the guiding "white line" on the roadway, are doing good service. But there is an increasing tendency for motorists to disregard warnings made for their benefit. In the growing traffic rush drivers are inclined to trespass beyond the white line; but it is hardly possible for them to disregard the road lighthouse.

FIG. 1.—A typical Road Searchlight. Such searchlights were first introduced at Ruxley Corner, Kent, shortly before the War.

Although these lighthouses are increasing in number on our roads, they are very much widely used in the United States. This has given rise to an impression that they are of American origin. In actual fact, we are informed that the credit for their introduction lies with this country. The first experimental installation was put up at Ruxley Corner, Kent, shortly before the war; naturally, the outbreak of hostilities interfered with their development in this country, and meantime they were actively taken up in the United States.

In general these lights are operated by dissolved acetylene, the regular "winking" effect being produced by an ingenious automatic pressure valve. In areas where electricity is available, electric lamps operated by a special electromagnetic control (at present thermostatic devices are not sufficiently accurate and reliable for this purpose) may be used. But the installation is more expensive, and it is not always convenient to make connections to the mains in the roadway. Hence the apparatus utilizing dissolved acetylene, which is relatively cheap in running cost and will operate for long periods without attention, is most usual. The removal of the tube of dissolved acetylene and the substitution of a freshly charged cylinder is a simple matter.

At this stage it may be well to say a word or two regarding this process of storing acetylene. The process makes use of the fact that the liquid acetone, under a pressure of ten atmospheres, is capable of absorbing about 240 times its own weight of acetylene. When the pressure is released the acetylene gas is at once expelled. When witnessing the process of charging at the works of the Gas Accumulator Co. Ltd., at Brentford, the writer was struck by the close analogy between the charging of these cylinders and the charging of electric accumulators. In both cases it is inexpedient to leave the apparatus in a totally discharged condition; and in both cases there is a limit beyond which discharging should not take place. The first charge given to a new cylinder also has certain resemblances to the treatment of a new electric battery. Before the acetone will take up its full charge the cylinder has to be subjected to several successive charges and discharges; in other words, the material has to be "formed." The acetylene manufactured for use in dissolved acetylene outfits must be scrupulously cleaned and purified; otherwise rapid fouling of the burner would occur, and the units would no longer be left for long periods without attention. The result of this purification is evident in the fact that there is no indication in the charging station of the odour usually associated with acetylene gas (which is mainly due to impurities). Instead there is a faint ethereal smell somewhat recalling that of anæsthetics—and it is interesting to note that acetylene has recently been used for this purpose.

Buoys used to mark shoals and channels, small coast beacons and river lights are also frequently fitted with dissolved acetylene. On the occasion of our visit we saw a series of units on iron tripods destined for use on an African river. Such units are, in fact, in general use all over the world, and are frequently operated by the Dalen sun-valve, which automatically extinguishes the light after sunrise and turns it on again after sunset. This well-known device is based on the difference in expansion of two rods, one polished and one presenting a mat black surface under the action of sunlight. It may be recalled that at the recent conference of the Institution of Public Lighting Engineers the question was raised whether this device could be applied to public lamps. Apart from the fact that the action is hardly sufficiently "sharp" for this purpose, there is one other consideration which obviously limits its use—the degree of daylight reaching each public lamp will naturally vary according to the height of surrounding buildings, etc. Consequently it would be, in practice, impossible to ensure that all public lamps would light up at the same moment.

For large coastal lights, where electric lighting is desirable, and where there is no regular source of current, complete units equipped with petrol-driven sets are supplied. In many cases large incandescent lamps are coming into use, particularly when a light of moderate power is desired and when rapid flashing is desirable. Lamps of moderate consumption—say 500 or 1,000 watts—can be flashed by an appropriate switch. But with lamps of higher consumption continuous lighting-up and extinguishing of filaments is apt to be unduly prejudicial to the life of the lamp, and the character of the signal may be rendered somewhat unintelligible by the slow nigrescence of the filament. Accordingly shutters are preferable in such cases. Lamps of very high consumption, 4,000 watts and even higher, have been designed for lighthouse work, and their manufacture is something of a feat. In operating such lamps the very heavy starting current requires to be guarded against by appropriate switching devices.

When a somewhat wide beam is desired the high candle-power secured is doubtless an advantage. But in the case of a concentrated beam there does not seem to be much object in aiming at very high candle-powers, as the maximum beam-candle-power (which depends essentially on intrinsic brilliancy) cannot be very materially increased by this means. One interesting recent development may be mentioned. It is, above all, necessary that coast lights should be absolutely reliable and continuous in action. Accordingly outfits are now designed in such a manner that, if one lamp fails, another one is immediately substituted; automatic substitution may likewise be applied to two alternative systems of light, e.g., in emergencies an electric lamp may be replaced by one operated with acetylene or town gas.

The use of light for aerial navigation was the subject of a paper read by Mr. H. N. Green before the Illuminating Engineering Society in 1927.* The provision of "aerial lighthouses" is essentially a different problem from the lighting-up of landing places. Whilst acetylene lights may prove useful for marking out boundaries and assisting landing, it seems likely that such illuminants as the neon beacon and high-power searchlights will be preferred for lighthouses to be seen from afar. How far it is desirable to "blaze a track" by lights of moderate power at short intervals seems debatable. The method has been adopted on the long-distance routes in the United States, but it is hardly needed on the comparatively short distance involved in the British cross-channel service. There is, moreover, a further consideration. A navigator at sea can never hope to have his route marked out for him by lights, though they may aid him in avoiding certain dangerous spots and in approaching the shore. Similarly the aerial pilot over the world routes of the future should learn to navigate by the aid of compass, the stars and such glimpses of the earth below him as he can get. It is a question whether the skill in aerial navigation can be fully developed if the aviator becomes accustomed merely to "follow a line of lights." This is one reason why the attempt to outline routes by numerous lights is apt to be discouraged; though doubtless methods of lighting important landing places, aerodromes, etc., will be carried to even greater lengths in the future.

A Novel Illuminated Sign.

An ingenious illuminated sign, closely resembling the neon sign in appearance, was exhibited at the last meeting of the Illuminating Engineering Society.

The script lettering is in this case formed of artificial resin or other translucent material, which acts like a plano convex lens, the surface facing the interior of the sign being flat. Behind the lettering, which stands out in vivid colours on a dark background, is a plate of diffusing glass, and the interior is occupied by incandescent lamps. Whilst the vivid coloured lettering resembles that of a neon sign, no high tension is necessary, as the sign uses ordinary incandescent lamps, and the cost of installation is stated to be very moderate. Any desired colours may be used, and both sides of the sign may be occupied by appropriate lettering. We understand that the manufacture of this sign has already been actively taken up abroad, and that Messrs. The Tungsram Electric Lamp Works (Great Britain) Ltd. are open to receive proposals for its development in this country. No doubt considerable interest will be shown in this striking novelty.

The Lighting of the Empire Theatre

The adjacent illustration shows a view of the handsome crystal electrolier, 6 feet in diameter and weighing about half a ton, which has been installed in the main entrance foyer in the Empire Theatre. Similar fixtures, but containing only 42 lights, are placed in the tea lounge. In the two vestibules the fittings are designed in the style of the famous Versailles lantern, and furnish fine examples of cast bronze work, the fine detail of the acanthus leaf being specially worthy of attention.

* *The Illuminating Engineer*, May, 1927, page 133.

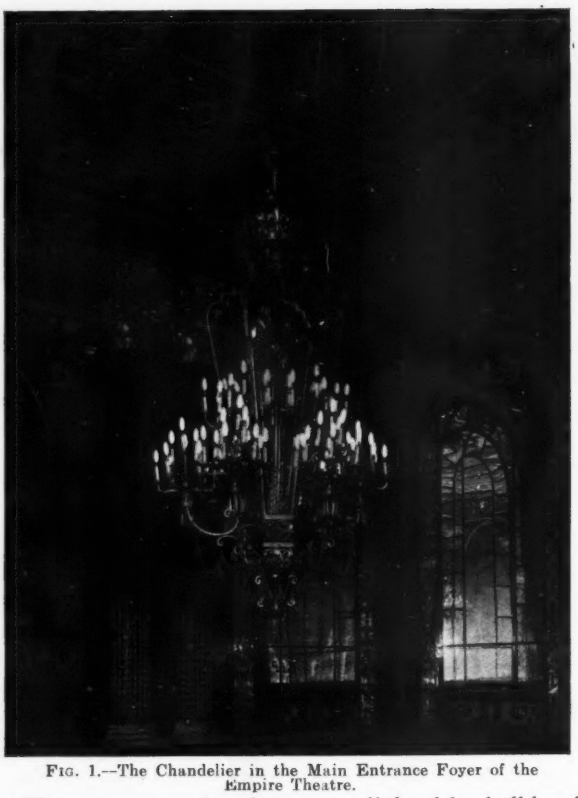
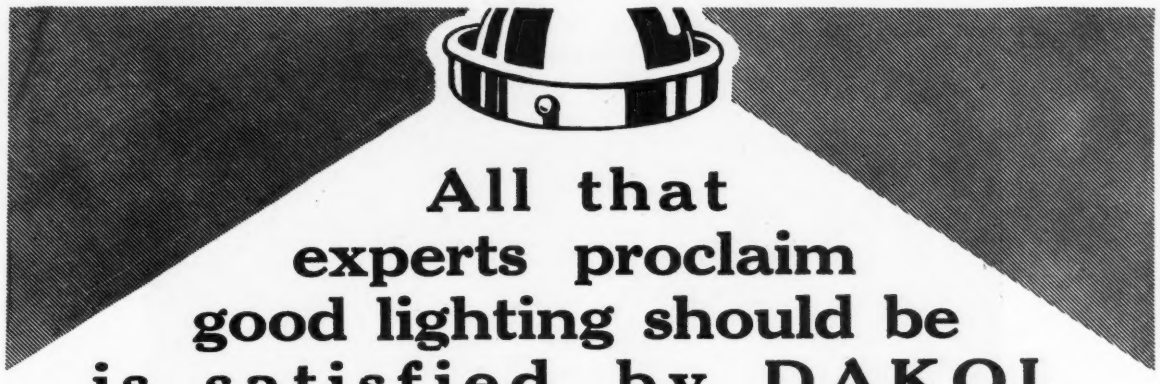


FIG. 1.—The Chandelier in the Main Entrance Foyer of the Empire Theatre.

The passages and staircases are lighted by bulkhead fittings, which harmonize with the simple scheme of decoration. On the orchestra and balcony walls crystal brackets of pleasing appearance are used.

We understand that the whole of the decorative lighting fixtures for this building were executed to the designs of the architect by Messrs. Metro-Vick Supplies Ltd.



All that experts proclaim good lighting should be is satisfied by DAKOL

Report by

Professor W. M. THORNTON, O.B.E., D.Sc., D.Eng., M.I.E.E. (Professor of Electrical Engineering, Armstrong College, Newcastle-on-Tyne).

January 5th, 1927.

Dear Sirs,

I have compared the spectrum of a gasfilled lamp fitted with the Dakol Screen and Reflectors with the following sources of illumination : diffused daylight, a gasfilled lamp without screen or reflector, a metal-filament lamp at normal voltage, and a mercury-vapour lamp.

The results are given on the accompanying coloured drawings, taken directly from the spectrum as thrown on to white paper.* These show that the metal-filament lamp spectrum is richer in red and orange rays and deficient in blue. In the gasfilled lamp the yellow and green are more pronounced and the light is bluer. The Dakol Screen cuts out most of the yellow rays and emphasizes the blue and violet. The result is to make *the combination of a gasfilled lamp and this screen a close approach to diffused daylight,* not quite so rich in the deep reds or in the extreme violet, but giving, over the range of colour of the solar spectrum, *a good basis for colour matching of fabrics.*

I have tried the light for reading and working. It is *singularly cool and restful,* and *gives illumination of the quality of daylight* when and where the latter cannot be had.

The curves of intensities express the relative values of the colours in the various spectra.

It may be remarked that the sensitiveness of the eye to colours depends on the intensity of the source of light. When this is low, as in twilight, the eye becomes more sensitive to the blue end of the spectrum. The curves have the same shape but are moved bodily to the left, so that the maximum sensitivity, which in strong light would be near the orange part, in weak light is in the blue-green.

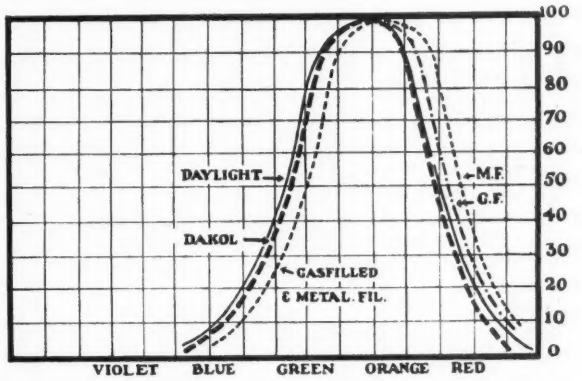
Yours faithfully,
(Signed) W. M. THORNTON.

* Coloured Spectra free on request.

DAKOL converts ordinary electric light to the quality of daylight, suppressing all harmful rays and all glare.

Professor H. S. Holden, D.Sc., F.R.S.E., Head of the Biology Department, Nottingham University, finds Dakol ideal for microscopic work, enabling the microscope to be used for long periods without undue eyestrain. Professor Bailey, Professor of Electrical Engineering at the Heriot Watt College, Edinburgh, finds fine wire winding—impossible in ordinary artificial lighting—can be done in Dakol.

Dakol lighting is used in the Universities of Edinburgh, Glasgow and Nottingham.



Curves of Relative Luminosity of Daylight, metal-filament lamps and gasfilled lamps with and without Dakol screen and fitting.

The vertical differences show the relative values. Thus, in the green, daylight is at least 30 per cent. better than in a metal filament lamp.

Extract from Report in *The Lancet.*

January 15th, 1927

THE DAKOL DAYLIGHT SCREEN.

A recent article in *The Lancet* (1926, ii, 1251) on Light and Typesetting prompts a notice of translucent colour screen, designed to produce a close approximation to daylight when used in conjunction with metallic-filament lamps of the half-watt type. The DAKOL Daylight Screen consists of a glass screen, clear blue in colour, mounted in contact with a special diffusing screen.

Owing to the high percentage of light transmitted, the resulting illumination is much stronger than that produced by some other Daylight Lamps for the same consumption of electrical energy.

After a few minutes in a room lit with DAKOL Screened Lights, it becomes impossible to distinguish by eye the blue colour of the screen, which now appears perfectly white. *It was only in comparison with the ordinary artificial yellow unscreened light that the new light now seems blue in shade.*

There is no doubt that artificial daylight has a great future in industry; actual tests have already shown a smaller percentage of mistakes and breakages in workshops and offices where this system has been installed, and as the advantages become recognized it will be more widely used in clinical and diagnostic work.

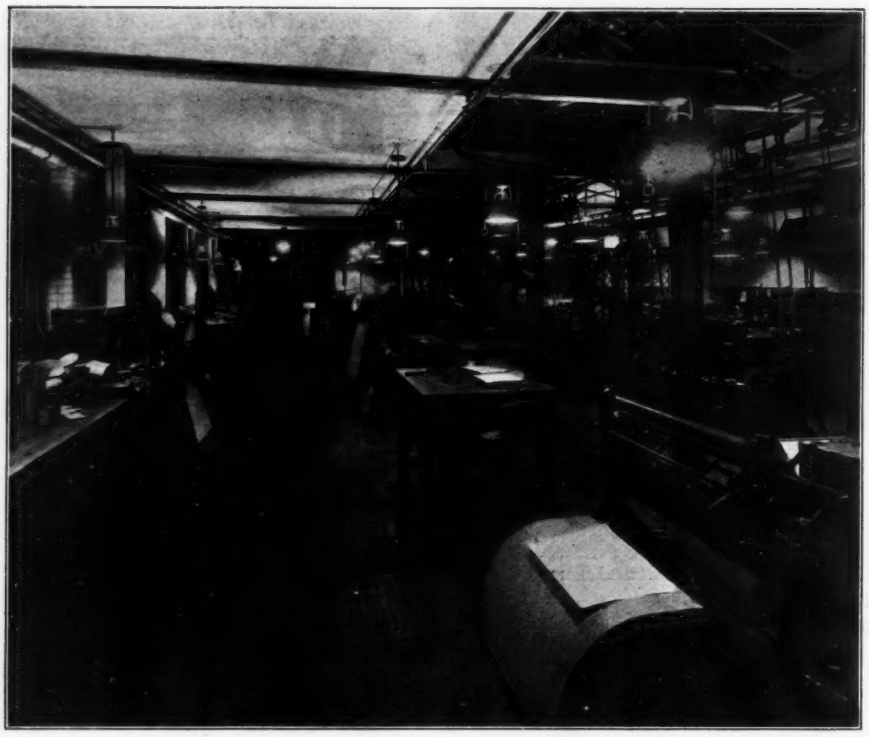
The essential points of such illumination are, first, light of the right colour distribution and, secondly, a sufficient intensity of that light.

DAKOL

ELECTRIC DAYLIGHT

Chief Sales Office:
39, VICTORIA STREET, LONDON, S.W. 1

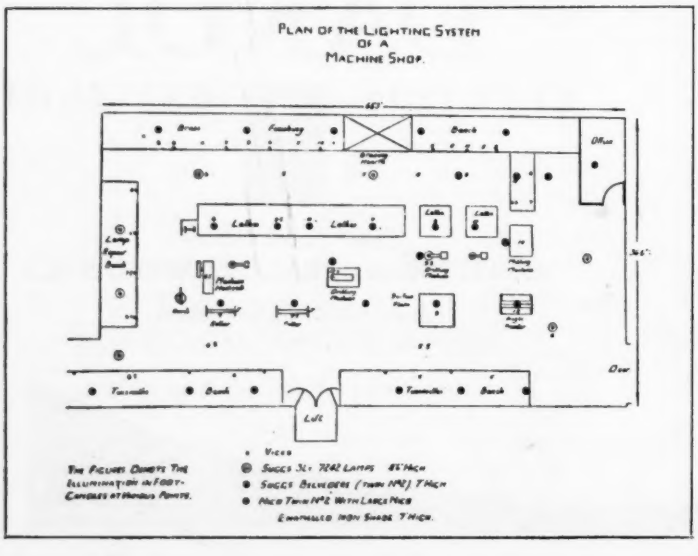
Registered Office and Works :
BYRON STREET, NEWCASTLE-ON-TYNE



Gas for the Lighting of a Machine Shop

ON this page are shown two night views of a well-lighted machine shop, 66 ft. 3 ins. long by 36 ft. 6 ins. wide. The plan indicates the disposition of the machines and lighting units, the illumination in foot-candles produced at working points on the various machines and benches, and the types of gas lamps used.

It will be seen that the shop is a fairly low one. For this reason, among others, Sugg's two-light "Belvedere" pendants were chosen as the lighting units for the machines and benches. The pendants have fairly deep shades of a unique design, details of which can be seen clearly in the illustrations. These shades effectively screen the naked gas mantles from the eyes of the operators and direct the bulk of the light on to the working areas. They also, however, allow a certain amount of light to pass in an upward direction, thus assuring overhead brightness and adding an impression of loftiness to the room. The shades are of a kind that permits of easy cleaning, thus enabling the workmen to keep them always in first-class condition. The pendants are fixed 7 feet above floor level.



For the general illumination of the gangways additional three-light units are installed. These are Sugg's No. 7242 lamps, with shallow conical reflectors, fixed 8 ft. 6 ins. above floor level. The three burners of this lamp are controlled by a single gas-and-air regulator.

The superheaters fitted over the burners of both pendants and lamps preheat the gas-and-air mixture, which gives a higher duty than gas without superheater.

The general effect is shown in the above illustration. There is no glare, and ample illumination is provided in all parts of the room. There should be no need to emphasize the importance of good illumination in a machine shop where accurate processes are carried on, and where unsatisfactory lighting conditions are particularly liable to handicap the worker and to result in diminished output and to impair the quality of the work done.

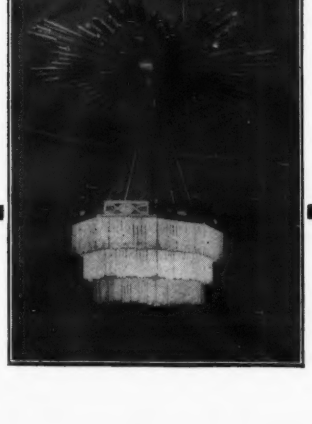
Decorative Lighting for Theatres

The illustration above shows one of the "Met-Vick" Fittings supplied to the Architect's designs, for the New EMPIRE Theatre, Leicester Square.

This fitting, which is in the Main Entrance Foyer, is six feet in diameter and weighs about half a ton.

The lower illustration shows a "Met-Vick" Fitting supplied to the Theatre Royal, Bolton.

For all Theatre lighting problems consult "Met-Vick."



METRO-VICK SUPPLIES LTD.

155 Charing Cross Rd., LONDON, W.C.2

Showrooms :—
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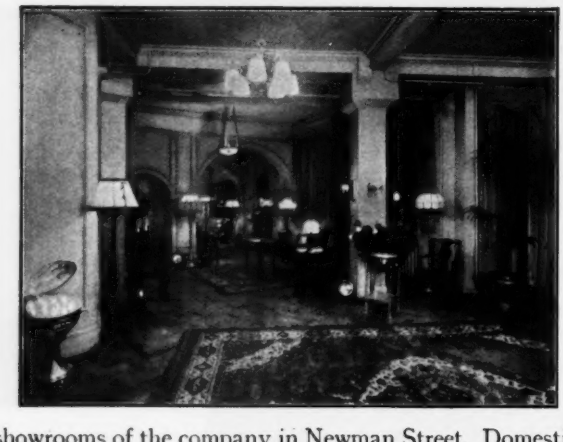
Belfast : Leeds : Manchester
Cardiff : Edinburgh : Glasgow : Newcastle-on-Tyne : Sheffield : Swansea

86
222

New B.T.H. Demonstration Rooms at Crown House

An interesting event on December 6th was the opening of the new showrooms of the British Thomson-Houston Co. Ltd., at Crown House, Aldwych, the objects of which were explained by Mr. J. L. Wilson at the inaugural luncheon held at the Hotel Cecil.

This new demonstration is planned on novel lines, the idea being to avoid overcrowding and enable specially interesting productions to be conveniently seen. Crown House thus acts as a useful supplement to the extensive



showrooms of the company in Newman Street. Domestic light, heat, power and cooking apparatus was on view. Special interest attached to the new B.T.H. refrigerator and the gramophone-radio apparatus, the operation of which was demonstrated to visitors during the luncheon. This device enables the output from the gramophone needle to be transferred electrically to a radio loud-speaker, with greatly improved results as regards volume and tone. The gramophone may be used either with the simple needle attachment or with this supplementary loud-speaker; and the latter, by merely operating a plug, can either reproduce from the gramophone or transmit the wireless programme.

It is, however, chiefly the lighting exhibits at the new showrooms which demand our attention. Many of the fittings, amongst which "modernistic" types were included, were of a novel character, and the avoidance of overcrowding enabled them to be shown to advantage. The showroom is also furnished with spectacular colour lighting from diffusing-glass skylights. At the entrance there are two model show windows, where the latest colour-changing devices and novel methods of window lighting are demonstrated.

We understand that it is the intention to alter the contents of these demonstration rooms at frequent intervals, so that visitors may always be sure of seeing something new and interesting.

Sheffield Illumination Society

FIFTH ANNUAL GENERAL MEETING.

The fifth annual general meeting of the Sheffield Illumination Society (which was founded in 1924 by the City Lighting Engineer, Mr. J. F. Colquhoun) was held on December 12th last in the Corporation Lighting Department, Corporation Street, Sheffield, when the following officers were elected for the 1929 session: President, Mr. W. Hughes; Vice-President, Mr. G. Sayer; Hon. Treasurer, Mr. R. Parker; Hon. Secretary, Mr. E. Marrison, c/o 42, Corporation Street; Assistant Hon. Secretary, Mr. M. G. Lockwood; Auditor, Mr. J. Whitehead, junr.; Committee, Messrs. G. Wilson, E. Selwood, Herbert Twigg, P. Twigg, W. Newcombe, A. Chatterton, Horace Twigg, W. G. Brookfield and J. Watkinson.

The membership of the Society is 104.

During session 1928 lectures have been given by Mr. E. E. Sharp, of Venner Time Switches Ltd.; Mr. G. Sayer, of the Sheffield Corporation Lighting Department; and Mr. W. J. Hadfield, City Surveyor, Sheffield Corporation.

The next annual outing which the Society propose to have will take place in June, 1929, when a visit will be made to York.

INDEX (January, 1929).